agriculture

Vol. 74 No. 11 November 1967

Published for the Ministry of Agriculture, Fisheries and Food
by Her Majesty's Stationery Office

1s. 3d.
MONTHLY

Pre- Royal Smithfield Show Issue

SILCOCKS SCORE ANOTHER "FIRST"

Silcocks bring precision to pullet nutrition

Exploding outworn concepts is no new feature of Silcock policy. It has happened on notable occasions in the past—now it has happened again. For Silcock research has produced another revolution . . . this time in poultry nutrition.

NOW Silcocks with a new range of pullet rearing and laying foods move the emphasis from intake of food to intake of actual nutrients contained in the food. Moreover nutrient intake is related to all factors affecting it: breed, age, production level, health.

Guesswork is out. Precision is in. The practical benefits are higher production, lower costs, superb quality, greatly increased profits.

The new feeds are available everywhere from November 13, and you can be sure your local Silcock Agent will lose no time in telling you about them.

For prior information write to R. Silcock and Sons Ltd., Dept GA Stanley Hall, Edmund Street, Liverpool 3 for a copy of the new Silcock Poultry Book.

SILCOCKS

PRECISION IN NUTRITION

Agriculture

VOLUME 74 . NUMBER 11 . NOVEMBER 1967

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London, s.w.1

Contents

page

The Future of Fat Cattle Auctions *W. G. R. Weeks* . . . 507
The Thin Sow Syndrome *A. J. Stevens* 510
The Prevention and Control of Poultry Diseases (1) *R. G. Holmes* . 514
Beef Production—A System for Single-suckling *T. Tweddle* . . 517
The Economics of Large Tractors *J. B. Finney* 520
Tax in Perspective: Capital Gains Tax *G. H. Camamile and E. S. Carter* 524

FEEDS AND FEEDING FEATURE
Mechanized Feeding of Livestock *R. G. Mortimer* . . . 528
Bulky Feeds *J. R. Hopkins* 534

Liquid Feeding for Pigs *R. A. Turner* 536
Ministry's Publications 539
Seed Potatoes *R. B. Mair* 540
Farming Cameo Series 4: 5. Buckinghamshire *G. R. C. Gibson* . 545
From the ALS: Low Cost Timber Buildings *T. V. Yabsley* . . 547
In Brief 549
Book Reviews 551

© *Crown copyright 1967*

Provided that the source is acknowledged in each instance such articles and notes as are published in this Journal without any specific reservation regarding copyright may be reproduced in any registered newspaper or public periodical without special permission. The Ministry does not accept responsibility for statements made, or views expressed, in signed contributions to this Journal or in those reproduced from another source.

Further, the Ministry does not accept responsibility for any of the private and trade advertisements included in this publication.

In the interests of factual reporting, occasional reference in this Journal to trade names and proprietary products may be inevitable. No endorsement of named products is intended, nor is any criticism implied of similar products which are not mentioned.

All communications respecting advertising in the Journal should be addressed to the Advertisement Contractors, Cowlishaw and Lawrence (Advertising) Ltd., Memorial Hall Buildings, 16 Farringdon Street, London E.C.4. Telephone: 01-248 3718.

PREVENTION IS BETTER THAN CURE

.... and cheaper in the long run ...

PPLO, the primary cause of CRD in poultry are responsible for cash losses amounting to millions of pounds each year. Tylan kills PPLO

A Tylan preventive programme to control CRD at its source, reduces mortality, improves weight gains, usually increasing feed conversion efficiency by a margin more than sufficient to meet the cost of medication.

In terms of productivity alone the advantages of a Tylan preventive programme are significant. Add to them the profitability factor and you will quickly recognise the truth of the adage 'prevention is better than cure'.

AP167

TYLAN
trade mark
for the control of CRD in poultry

ELANCO

Elanco Products Limited
Broadway House
The Broadway London SW19
Tel: Liberty 6600

AGRICULTURE NOVEMBER 1967

The Future of Fat Cattle Auctions

W. G. R. Weeks

THE future role of the fatstock market in the structure of agricultural marketing has been the subject of much discussion and debate during the period before and after the publication of the Verdun Smith report. As part of the research project sponsored by the Fatstock Marketing Corporation, the University of Newcastle upon Tyne and AMDEC an investigation was undertaken into the structure, conduct and performance of fat cattle auctions of Britain.

Attracting buyers

Arising from the report* recently published by the University of Newcastle upon Tyne it was clear that fat cattle auctioneers go to considerable lengths to attract a large number of potential buyers to their auction markets. In particular the days devoted to fat cattle sales in a geographical area are arranged, whenever possible, so that each market has its own auction day for selling a definite category of stock. Additionally, when the market premises are used by more than one firm of auctioneers the firms concerned usually hold their sales on the same day although the actual sale times may vary. This indicates that auctioneers are well aware that their markets would operate less efficiently and therefore less profitably if similar sales were held in competing markets on the same day, or in the same market on different days. This shows that auctioneers endeavour to obtain the highest prices possible for their patrons' stock.

It may be that this apparent understanding between auctioneers not to hold fatstock sales on different days of the week is tantamount to an admis-

*_Fat Cattle Auction Markets in Great Britain:_ University of Newcastle upon Tyne, Department of Agricultural Marketing Report No. 3.

sion that a certain minimum number of buyers and sellers are necessary for an auction market to function satisfactorily, and that large markets have an advantage over small markets in this respect. Additionally, the importance that auctioneers attach to the need for prior notifications of all animals being entered for sale is further evidence that they attempt to obtain the highest prices possible for the stock.

Competition

It is possible that in the future some smaller auction firms will amalgamate or close down the animal auction part of their businesses leading to a concentration among fewer larger firms. Many small auctions lack the modern facilities to attract buyers and sellers; many small firms use their auction premises on only one day per week and fat cattle sales are just not large enough to justify nearby abattoirs and cold stores. Furthermore, the emphasis placed on the need for an improved local supply of more uniform cattle suggests that at least some firms are too limited as to the area from which they can attract cattle, and sell too few to enable some buyers to obtain the number they require of a particular type. However, as a large proportion of auctioneering firms combine cattle selling with other complementary types of business this suggested reduction in the number of firms may be a slow process.

It can be assumed that the auction market is a less efficient determinant of prices than many auctioneers believe. For example, apart from the large proportion of markets selling very few fat cattle the bulk of purchases are made by relatively few wholesale buyers. This in itself does not necessarily imply a complete lack of competition, but taken with the widespread giving and taking of variable amounts of 'luck money' together with the oft-repeated suggestion that sellers reputed to be good 'luck' givers get perhaps better prices for their animals does indicate that competition between buyers may be, sometimes, less than perfect.

Location of markets

The location of the market, rather than competition between auctioneers or differences in pricing efficiency, appears to be the important determinant of where fat cattle will be sold. The majority of auction firms providing data for the report normally dealt with cattle within a twenty-mile radius, while over sixty-six per cent of the auction firms were sole users of the premises in which they operated. Moreover, of the markets attracting sellers from more than twenty miles away, over forty per cent were in Scotland and Wales where in certain areas distances between auction markets are frequently greater than in England. This suggests that many farmers find it easier to patronize their nearest market for the disposal of fatstock and, therefore, a large number of auction firms tend to be shielded from competition with neighbouring firms, except for the business of farmers situated on the edge of their market areas.

Large numbers of farmers offer their fat cattle for sale without previously notifying the auction company, hence the auctioneer has not infallible control over the number of stock entered for any one sale. The number of animals on offer is more dependant on the prices of recent weeks than on the sellers' knowledge of probable supplies on different sale days. It may, therefore, be inferred that price fluctuations may be greater than would be the case if prior notice of sale was compulsory.

It was pertinent to note that no evidence was obtained from the investigation to show that if supermarket chains gained a greater proportion of the fresh meat trade that business done at fat cattle auctions would decline. Most supermarkets have so far found it convenient to buy their fresh meat supplies through meat wholesalers who, in turn, buy the bulk of their supplies at fatstock auctions.

Regarding rates of commission charged by different firms in different areas, despite wide variations in the nature of additional charges, these are small when compared with the value of the fat animal. This supports the opinion that market location, rather than price competition between auctioneers is the more important determinant of where fat cattle will be sold. But all auctioneers stressed the long-term importance of good market facilities and personal contact with buyers and sellers as factors affecting future profits.

Other systems of sale?

Under the present pattern of fat cattle production—assembly distribution, slaughter and sale—the auction market provides farmers with a reasonably efficient means of selling their fatstock. It may be that the future will see a reduction in the relatively large number of very small markets situated in the remoter country areas, and to ensure profitable survival modernization of others appears desirable. However, it seems likely that there will be little immediate change in the fatstock auction system and that the majority of fat cattle will continue to be sold via the auction market, unless there are important changes in fatstock production or in alternative methods of fatstock sale. In this instance, the development of large scale production of more uniform fatstock would tend to favour contract production. Additionally, should increased knowledge of conformation and quality differences, together with the availability of more uniform carcases, make it practicable to introduce an efficient and comprehensive system of deadweight grading, it is likely that many more farmers would prefer to sell direct to wholesalers or, indeed, the multiple chains of retailers. Neither development is likely in the future and as the continued existence of the auction market does not depend solely on the sales of fatstock, the future for the fatstock auction reveals little change.

W. G. R. Weeks, B.Sc. (Hons.), F.R.Econ.S., is a Lecturer in Agricultural Marketing at the University, Newcastle upon Tyne.

Agricultural Power Take-off Shafts and Guards

The British Standards Institution have announced the publication of Part 4—Power input connection—drawbar height relationship of B.S. 3417: *Agricultural power take-off shafts and guards*. Copies of B.S. 3417 may be obtained from the B.S.I. Sales Office 101-103 Pentonville Road, London, N.1, price 4*s*. 0*d*. (by post 4*s*. 6*d*.).

The Thin Sow Syndrome

A. J. Stevens

NEW diseases are always popular—at least with the vets—and, I am inclined to think, with the farming community also. If a farmer has to have a disease, he likes to think that it is at least a new one! But the 'Thin Sow Syndrome' is not quite satisfactory as a new disease. We have always had some thin sows, and have always known a number of causes why sows can be thin. The word syndrome implies, and correctly too, that we do not quite know what it is all about. Perhaps the only two things we can say with certainty are that during the last four years there has been an increase in the number of thin sows, and we have been unable to attribute their thinness to any one specific disease. Examinations have ranged over a wide variety of possibilities, including parasitism, vitamin and mineral deficiencies, groundnut poisoning, and diabetes. Eminent workers in many fields have worked diligently on the problem and voiced different views on the cause. Knowledgeable farmers have tried practical experiments and expressed equally strong opinions on supposedly successful treatments. The problem remains and I can only add my views and experiences to those already expressed.

Whenever a 'new' disease appears it is as well to stand back and look from afar. Microbes tend to confuse microbiologists and vitamins to blind nutritionists until the broad picture is obscured. Among the major changes which have affected sows during the last four years are:

1. A new appreciation of scientific feeding particularly during pregnancy.
2. The introduction of sow stalls.
3. Early weaning systems.
4. A revised view of the significance of the different species of gastro-intestinal worms.

It is my belief that all these changes play a part in the thin sow syndrome.

Restricted feeding

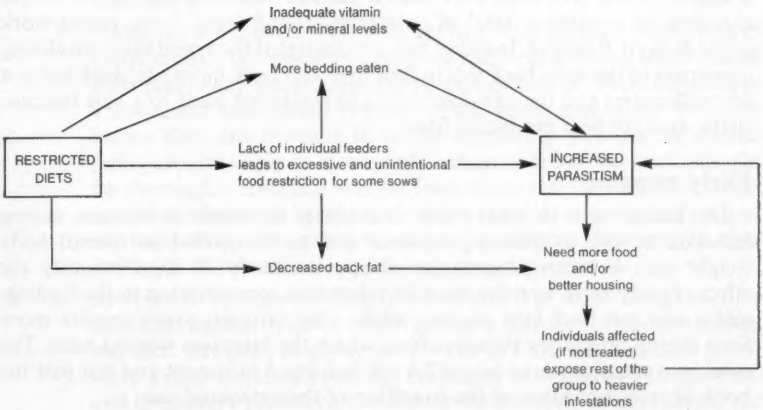
The excellent work by Dr. Lodge and his colleagues at Nottingham University, made us aware that sows were receiving unnecessary quantities

of food during pregnancy. However, such was the appeal of cutting the food bill by 50 per cent, that many farmers rushed to feed 4 lb instead of 8 lb of meal per sow per day, without reading the rest of the instructions. For example, it has since been shown that to ensure that each sow in a group of ten sows fed together receives 4 lb of meal, we do not require $10 \times 4 = 40$ lb, but 60 lb. The bullies always get more and the meek get less! Obviously individual feeders are a prerequisite to restricted diets. Again we must remember that pigs are individuals and, like ourselves, their requirements vary. A sow losing weight requires more food whatever 'the books say' or, as we will see later, a vicious cycle can be set up. Rations can be reduced to the 4 or 5 lb level but it is important to remember that they should still contain the same amount of vitamins and minerals as did the 8 lb ration previously. A large sow requires more maintenance ration than a gilt, but a gilt is still growing and therefore requires more food for growth. Both factors must be considered when working out the rations.

The lesson is basically simple. Without doubt sows have received unnecessarily high amounts of concentrate food in the past, but restricted diets, practised without common sense and a good stockman's consideration for his individual charges, will soon lead to trouble.

THE THIN SOW SYNDROME

HOW IT MAY ARISE


Inadequate vitamin and/or mineral levels
More bedding eaten
RESTRICTED DIETS
Lack of individual feeders leads to excessive and unintentional food restriction for some sows
INCREASED PARASITISM
Decreased back fat
Need more food and/or better housing
Individuals affected (if not treated) expose rest of the group to heavier infestations

Worms

If a sow does not get this consideration it inevitably tries to help itself, and one of its methods is to consume large quantities of the bedding, particularly straw. There is no evidence to suggest that this in itself is harmful, though she is not equipped to utilize such fodder as food. However, an important side effect is that she can then consume large quantities of infective

worm larvae along with the bedding. In the past we have tended to think of worms in pigs only in terms of the large round ascaris worms mainly affecting young pigs out at pasture. Now we recognize that the thin strongyle worms, and particularly the stomach worm Hyostrongylus, can also cause damage. Hyostrongylus is a poor egg layer and its eggs are not easily distinguished from those of Oesophogostomum, a less harmful worm of the large intestine. It is easy therefore to overlook its presence or belittle its significance, but a sow consuming large quantities of straw in a deep strawyard can readily reinfect itself with this type of worm. A succession of sows passing through the same yard and continuously rooting up the straw, is an ideal way of encouraging excessive parasitism.

Sow stalls

Sow stalls, and particularly those equipped with slatted floors, would appear to solve both the problems of individual feeding and worm infestation. This is largely true but not infallible. It is remarkable how a few inches extra width will allow a sow to turn within the stall and gain access to her own dung, and, do not forget, a sow once she becomes thin will turn that much more easily! Occasionally a considerate owner, endeavouring to make a poorly-constructed stall more comfortable, will introduce a little straw at the back. The sow, extremely eager for something to chew between meals, soon learns to scrape the straw forward and consume it along with its faecal contamination and worm larvae.

Sow stalls themselves can be a source of potential harm if we forget our commonsense approach to animal husbandry. In particular, the sows become totally dependent on the stockman for warmth and freedom from draughts. Some thin sows have shown marked improvement by the simple expedient of erecting a 'tent' of polythene around them. Some recent work at the Rowett Research Institute has demonstrated the remarkable insulating properties of the sows back fat. In thin sows this back fat can be depleted to a few millimetres and the consequent loss in insulation leads to a vast increase in the need for heat producing food.

Early weaning

Dr. Lodge went to great pains to evaluate the needs of the sow during lactation as well as during pregnancy and recommended an overall body weight gain between pregnancies of approximately 20 lb. Obviously the effect of early early weaning must be taken into consideration in the feeding, and a sow put back into pig five weeks after farrowing may require more food during pregnancy than one from which the litter was weaned later. The stockman must continue to use his eye and good judgment and not just the book of rules regardless of the condition of the individual sow.

We are now in a position to consider how all these factors might be involved in the 'Thin Sow Syndrome' and an hypothesis might be presented as shown in the diagram on page 511. This theory assumes that thin sows occur as a consequence of a sequence of events rather than because of any one disease or management procedure. Nevertheless it does suggest that two of the factors most frequently involved are restricted diets improperly applied, and worm troubles, even though thin sows can occur on large rations and without heavy worm burdens. Parasitism damages the ability of the intestinal tract to absorb and utilize the food and therefore requirements

become greater, and normal vitamin levels may become inadequate. One sow becoming affected exposes her companions to a greater risk. Thin sows need more food just to keep them warm, and cold sows soon become thin sows because they are using their limited food supply to keep themselves warm. Hungry sows eat more bedding and are therefore exposed to greater parasitic risks. The downward spiral can start at any point but each factor aggravates the next until a serious clinical problem results.

Control measures

Some support for this hypothesis is given by the success which often attends control measures based on the theory. The most important measures to try are:

1. Increase the level of feeding for all thin sows. It may be necessary to feed double or even triple rations until improved condition is obvious. Often large quantities of boiled potatoes are acceptable and produce a good response.
2. Feed the sows individually to ensure that each and every sow actually gets its ration.
3. Ensure that the food has an adequate and active vitamin and mineral content in relation to the total quantity of food fed. For badly affected sows skim milk and/or a dried yeast supplement can be very beneficial.
4. It may well be necessary to cull the worst affected sows, not only because they can never be treated successfully and economically, but because they have become a source of infection to their companions.
5. Break the worm cycle. This does not just mean giving a single dose of anthelmintic, but implies preventing reinfection. Sows which spend their pregnancy out at grass should be wormed 24 hours before they are weaned and turned out on to the grass, and again 24 hours before they are brought in to the farrowing quarters. A similar policy should apply to strawyards but, in addition, the yards should be thoroughly 'mucked out' at least every six months. The worm medicine used must be one such as tetramisole, or a mixture such as thiabendazole with picadex, which is effective against the thin strongyle worms as well as the large ascaris worms.
6. Sows must be kept sufficiently warm and free from draughts. This does not necessarily mean elaborate controlled environment housing, but such measures as giving extra straw in cold weather, care not to leave a door standing open, the avoidance of draughts through slats, and temporary partitions to keep up the numbers in the space if for any reason the sow house becomes half empty.
7. Perhaps most important of all, sows must be treated as individuals. The stockman must have an eye for detail, he must spot trouble in the earliest stages, and apply corrective measures before the vicious cycle really gets going. The measures required to restore normality are much greater than those needed to retain a healthy herd.

It is highly probable that other factors, for example lung worms, kidney trouble, metritis, gastric ulcers, and heart disease, play a part in some

outbreaks and an owner would be foolish not to seek full veterinary advice when troubled by a number of thin sows. One thing remains quite certain, it will require the most diligent and active co-operation between owner, pigman, and veterinary surgeon to seek out and correct those factors which have let this unhappy situation arise.

This article has been contributed by **A. J. Stevens, M.A., B.V.Sc., M.R.C.V.S., Dip. Bact.,** who is Superintending Veterinary Investigation Officer for the Ministry of Agriculture, Fisheries and Food in the Yorkshire and Lancashire Region.

The Prevention and Control of Poultry Diseases (1)

R. G. Holmes

During recent years people have become increasingly conscious of the fact that prevention of disease is better than treatment and, with all classes of livestock, owners are seeking advice on how disease can be prevented by improved management, vaccination, preventive medication, and selection of stock with genetical resistance. The swing towards intensification has led to the use of units in which large numbers of birds are kept under one roof at an increased stocking density. This, in turn, can predispose to poor performance and a rapid build-up of disease unless optimal environmental conditions are maintained. The result is often the use of a controlled environment house ensuring complete control over lighting, temperature and ventilation.

The control of disease may be aimed at several different levels. For example, it may go back at least as far as the great-grandparent stock with the selection of birds which have a natural resistance to certain specific diseases such as leucosis, or which have been tested and found to be free of diseases such as those caused by *Mycoplasma gallisepticum* and *Salmonella pullorum*. The supply flock in turn must also be free of these infections. In addition, care must be taken that eggs produced by these birds do not become infected by shell contaminants, either in the nest boxes or at the hatchery. Finally the chicks must be dispatched in new chick boxes and clean delivery vans to the rearing farms. From then onwards the performance of the birds will depend on the environment and general management, the cleanliness of the houses in which the chicks are put and the presence or absence of birds of different ages on the same premises.

It is not intended to discuss poultry diseases in general in this article but rather to concentrate on the more important diseases which can be controlled or eradicated by attention to management or the use of a vaccination policy.

The source of advice

Help and advice from a number of sources on both the prevention and treatment of diseases are available to the poultry owner. He may belong to a group which has its own veterinary adviser, or he may seek advice from his local veterinary surgeon. In addition, he may make use of diagnostic laboratories. These include the Ministry's Veterinary Investigation Centres as well as private laboratories run either by veterinary surgeons in practice or by commercial companies. When sending specimens to the laboratory for examination it is most important that a detailed history is submitted with the specimens because very often a particular problem is related directly or indirectly to managemental or environmental factors. The Ministry's Poultry Health Scheme was also introduced to offer help and advice on establishing and maintaining healthy sources of poultry stock. Members must comply with the requirements of the Scheme which include keeping approved records, submission of the birds to veterinary inspection and certain prescribed tests.

With some diseases, such as *Salmonella pullorum* and *Mycoplasma gallisepticum* infections, it is possible to achieve eradication from the flock at the parent or grandparent level and to rear chicks that are free of these infections. The more infectious conditions, such as Newcastle disease, infectious bronchitis and infectious avian encephalomyelitis ('I.A.E.' or 'epidemic tremor') must be controlled by vaccination. Otherwise, there will be a grave risk of severe economic losses when clean flocks are exposed to field infection.

Preventing the introduction of disease to the hatchery

Assuming that all possible precautions have been taken it should be possible to supply a hatchery with hatching eggs which carry no important shell contaminants and none of the true egg-transmitted infections within the egg itself. This aim, however, is not always achieved and infection may reach a hatchery in a number of ways. These include the use of contaminated egg boxes or trays, and introduction by vehicles, or by personnel such as sexers or van drivers. When possible, disposable equipment should be used. Any which must be used again should be cleansed, disinfected and fumigated.

Infection may also arrive on the shell surface or within the egg. The latter may be due to penetration of the egg shell or to the presence of infection within the egg when it was laid. True egg transmission occurs when, following a generalized infection, the causal agent becomes localized in the ovary (as with *Salmonella pullorum*) or in the air sacs adjacent to the ovary (as with *Mycoplasma gallisepticum*).

During some acute infections the virus circulates in the blood stream and may reach the ovary. Any follicles developing at this particular time may be infected. When this occurs with Newcastle disease it kills the embryo. With infectious bronchitis the virus appears to die towards the end of the incubation period and so far there is no evidence that actual transmission through the egg to the new hatched chick can occur. Leucosis may be transmitted by adult fowls which may not show clinical disease themselves.

In the case of epidemic tremor the laying flock may show a 10 per cent fall in egg production when first exposed to the disease. Egg transmission occurs over a period of about three weeks commencing shortly before the egg fall occurs. This is an instance emphasizing the importance of close liaison between the flock farm and the hatchery.

Some bacteria and fungi such as Salmonellae and Aspergilli can penetrate the intact egg shell. This is facilitated if the shells are damp or dirty. Eggs laid on the floor instead of in the nest boxes are particularly liable to infection and should be excluded from the eggs sent to the hatchery. To reduce the incidence of floor eggs adequate nest boxes must be provided and lined with wood shavings rather than hay or straw. Lights should not shine directly into the boxes and if communal types are used there should be several entrances to ensure that the birds have easy access. For the first few weeks after the birds come into lay it may prove worth while to reduce the amount of shavings in any nest box which becomes too popular and redistribute it daily, so that when the birds are fully in lay all the boxes are used equally. It is much easier to prevent floor laying than to stop it once it has started on a large scale.

Eggs should be collected three or four times daily and stored at around 56°F, without temperature fluctuation, until they are set. If egg dipping is to be carried out it should be on the day of collection before shell contaminants have had time to penetrate. Dipping is often followed by fumigation immediately before setting. Egg boxes and trays should be fumigated at the hatchery before being returned to the farm. Cardboard chick boxes must be burnt after use. From the hatchery the chicks may be sent to broiler sites or to rearing units. On the latter they may be kept on throughout the laying cycle or they may be moved to other premises as point of lay pullets.

The second part of this article, to be published in a later issue, will discuss the preventive measures available to the individual owner.

This article has been contributed by **R. G. Holmes, M.R.C.V.S., D.V.S.M.**, who is Assistant Veterinary Investigation Officer at the Ministry's Veterinary Investigation Centre, Norwich. Since qualifying at the Royal Veterinary College, London, he has particularly interested himself in diseases of poultry.

The Royal Smithfield Show will be held at Earls Court, London from the 4th to 8th December, 1967 (inclusive)

The photograph on the front cover is of the Supreme Champion of the Royal Smithfield Show for 1966

Beef Production

A System for Single-suckling

T. Tweddle

THIS old-established basic system of beef production plays an important part in the agriculture of Britain. Attracting as it does financial support in the form of Hill Cow or Lowland Cow subsidy as well as Calf Subsidy on its produce, the contribution to beef supplies is acknowledged. In the main, one tends to consider all forms of single-suckling as extensive systems but this is not necessarily true, nor is it essential to be geared to an autumn-suckled calf sale programme. Before deciding on the system to be followed certain basic decisions must be made and these can only be arrived at by consideration of the factors most important to success.

Contrary to popular belief it is probably easier to begin ones appraisal from the end rather than the beginning—a 'Grave to Cradle' approach as it were. When is it proposed to market the output from the system? The present outlook on beef production leads one to think of self-sufficient systems where the sale product is a finished animal—marketable at a reasonable weight and degree of finish from the available resources. This decision imposes a different set of demands than is the case when selling is tied to autumn-suckled calf sales. Remember, too, that a calf is only once to sell—therefore some thought must be given to maximizing return.

Other factors for consideration are:

The breed or cross of cows and their sources.
The breed of bull to be used (or possibility of A.I.).
The acreage available and possible stocking densities.
Type of winter feed available.
Availability or necessity for winter housing.
Times of calving and weaning.
The ability of the system to maintain regular calving.
Wearability of the cows.

Giving due consideration to all the factors bearing on the success of the venture let us look in particular at one system, designed to produce fat cattle with a subsidiary outlet of selling weaned calves on the usually buoyant spring market.

Breeding stock

On grounds of availability and the need for cows with size, milking quality and the ability to go in and out of negative balance (i.e., live off

their backs in times of shortage), one would select beef cross Friesian cows. In order that milking ability should not be impaired it is preferable that they be reared in the same way as dairy herd replacements are reared and bought into the herd as bulling heifers. This has the added advantage of releasing maximum acres on the beef farm to production stock. Growth potential and beefing qualities in the bull are essential and here one's choice would be a weight recorded bull of good beef conformation. There is some evidence that a bull of a third breed should be used to produce three-way hybrid calves in the slaughter generation. This certainly gives two lots of hybrid vigour and enables a breeder to exploit the merits of two beef breeds —the poll of the Angus and Galloway and the white face of the Hereford, for example; the size of the Charolais, South Devon and Lincoln Red and the quality of flesh of others.

Breeding programme

There are many reasons in support of calving in June/July, always accepting that when one plans to calve in July some calves will be born in late June and some in August. Cows would be served in mid-September/October, a time when they will settle readily. They would be in good condition at the end of a grazing season and would be likely to maintain a regular calving pattern. Calved outdoors in July, calves should be healthy and viable and the risk of disease is much less than if they were inside.

The flow of milk would be controlled by the amount of steaming-up (on grass) and the availability of feed after calving. Some restriction over the first 10–14 days might be necessary but after that the calf will take all the milk the cow can give. A poaching calf or two might be considered.

Suckling continues through the autumn with creep feeding for the calf as required. Weaning somewhere around New Year's Day presents a cow in early gestation to face a relatively short winter feeding period. Knowing that from turn-out until calving the cow will be able to make up any loss of condition incurred during winter, low plane diets of supplemented barley straw, indoors or outside are feasible. The weaned calf now around five months of age would be wintered, again a short winter period, preferably on hay with possibly some silage and increasing amount of concentrates, largely cereals. The aim at this stage is to achieve reasonable liveweight gain preparatory to turnout.

To ensure that there is a minimum of check on the change from indoor to grass feeding, calves should go out as early as feasible in spring, continuing winter feed outdoors until grass is adequate and they wean themselves. A minimum of 3–4 weeks should be allowed for each change of diet of this nature. These 9–10 month old calves at grass should have the choice of the most productive clean grass available and one would expect liveweight gains in excess of 2 lb/day at this stage provided that food is not limiting.

By mid-July some of the early calves could well be nearing finish at top quality light weights and meeting a strong market. It is important at this time that an increased acreage of clean grazing should be available for the remainder of the season. The cows meanwhile will have followed behind the calves and should be coming to calve in good order, and they would continue to graze the original grazing area. Given reasonable performance on grass the whole calf crop should be capable of being marketed fat before January when the following batch of weaned calves would require access to any buildings which were used.

Targets

Obviously one must aim at a 100 per cent calf crop and a low calving index and this time table of events should help to maintain both of these. High weaning weights should be possible with three-way cross calves from cross-Friesian dams, as are marketing weights of 7–9 cwt. Under lowland conditions stocking density should approach 1¼ acres per cow and calf with an added ¼ acre for grazing to finish. To achieve these targets the rates of gain of 2 lb/day or better on average must be the aim. This is a function of breeding and management. Checks of all kinds should be avoided and all changes in feeding made gradually, particularly changes on and off grass. Fertilizer usage needs to be high (2–300 units of nitrogen in addition to basic dressings of complete fertilizer) and some form of paddock grazing is essential even if paddocking is on a field scale. Mixed grazing of sheep with cows and calves presents many problems but alternate grazing of weaned calves and lambs will help to intensify stocking density and achieve the desired levels.

Adaptations

From the basic plan there are, of course, options which can be made. Weaners could well be sold in April/May on a brisk market if grass was not available at home. Similarly, in autumn if keep was not sufficient for wintering to fat, then stores could be sold. It is feasible, too, that instead of going to grass in the spring the calves could be fattened indoors to market by July in the era of high fat prices. July is also a time of good prices for quality stores bought to go on as second runners on fattening pastures.

This is not the only system which may be worked out to fit the single-suckled herd problem, but basing the enterprise on the selling of fat cattle with an option of store selling on high markets, this arrangement takes account of most of the important factors in the business. This programme applies not only to lowland conditions but also to upland areas and surely most of the conditions are satisfied. Even in hill areas where it is difficult to keep cows in production during winter, this pattern has application. This is particularly so where cows might be wintered away on arable farms from January to April/May, on a basically straw diet, returning to the hill to prepare for calving in July. Developing from this could be a much increased use of the hills mainly as summer grazing areas.

Budget Data

	July sale		Oct. sale		Dec.-Jan. sale	
Gross output	£ s.		£ s.		£ s.	
(6½ cwt @ £10)	65 0	(8 cwt @ £8 10s.)	68 0	(9 cwt @ £9 10s.)	85 10	
Calf subsidy	9 5		9 5		9 5	
Less cow and bull dep. etc.	8 0		8 0		8 0	
	£66 5		£69 5		£86 15	
Variables costs	£ s.		£ s.		£ s.	
concentrates (13 cwt @ 25s.)	16 5	(15 cwt @ 25s.)	18 15	(20 cwt @ 25s.)	25 0	
Other variable costs	2 0		2 0		2 0	
Feeding straw (16 cwt @ £5)	4 0		4 0		4 0	
Forage	6 0		9 0		11 0	
	£28 5		£33 15		£42 0	
Gross margin 1¼ acres	38 0	1¼ acres	35 10	1¼ acres	44 15	
Gross margin acre	30 0		27 0		30 0	

Timetable

June	calving
July	calving
August	
September	service
October	service
November	calves creep feeding
December	weaning
January	calves on hay (6lb concentrates) cows on straw (4lb concentrates)
February	calves on hay (6lb concentrates) cows on straw (4lb concentrates)
March	calves on hay (6lb concentrates) cows on straw (4lb concentrates)
April	turn out. Possible sale as stores
May	yearlings grazing first—cows following
June	first sales of fat
July	first sales of fat
August	

The author, who will be well known to many farmers, is the N.A.A.S. Regional Livestock Husbandry Adviser for the West Midland Region. He was born in County Durham, the son of a farmer/butcher. Before the war he was in partnership with his father, but on demobilization went as manager of several farms in Aberdeenshire. He joined the N.A.A.S. in 1949.

The Economics of Large Tractors

J. B. Finney

THE major part of our farm power requirement today is catered for by the 60–65 horsepower-wheeled tractor. Higher horsepower machines have come into use in recent years and have proved highly successful. The large tractors of 100 horsepower or more are comparatively expensive, but this is countered by the advantage of a man achieving more in a given time. The problem is to

ensure that the extra output per man is put to profitable use. It can be assumed that under most circumstances the higher power can be effectively transmitted through rubber tyres and that there are few technical difficulties involved.

How much power is required?

It seems likely that, for the most part, our farms have more than enough power available with their existing tractors. As far back as 1950 it was calculated that, from the power requirements of certain crops, farms were becoming progressively more over-powered. Since then the average power of farm tractors has risen steeply and, until very recently, numbers of tractors have increased each year. On the face of it there is plenty of power available.

One reads of large farms introducing a 100-horsepower tractor where the claim is made that the large tractor replaces three or four smaller tractors. This is no doubt true, but it can only mean that 100 horsepower replaces 150 horsepower, or that the original tractors were under-employed and some could have been given up without the introduction of the large tractor.

The principal advantage of having plenty of power available lies in timeliness. This applies particularly to the reduction of grass weed populations after combining and rapid spring cultivation and planting. Exactly how much time is available and what yield reductions can be expected when work is late is not known, but this is the centre of the whole discussion on large tractor economics. The estimation of power requirement has to be based on time available and work to be done. If power requirement could be strictly defined for any one farm and the labour force could be altered in size, the correct combination of numbers and types of tractors to give lowest total tractor and labour costs could be established. On the large arable farms this would include high-powered tractors.

Providing a suitable implement load for tractors

The object of properly loading a tractor is to make full use of the labour employed and the capital invested in machinery. Again, it has been pointed out over the years that tractors are generally not fully-loaded. The National Institute of Agricultural Engineering observed as early as 1944 that . . . 'the low figures for the rates of ploughing and cultivating with high-powered tractors indicate that these tractors are generally under-loaded'. High-powered tractors at that time were in the range 35–42 horsepower. An unpublished N.A.A.S. report indicates a similar situation with the present day high-powered tractors of around 100 horsepower. Fuel consumption has been taken as an indication of power used and tractors which at maximum power would use about 4½ gallons an hour are in fact using about 2–2½ gallons. There appears to be plenty of scope for increasing the output, through correct loading, of both 60 and 100 horsepower tractors at present in use. Engine efficiency also improves with correct loading, but this is not of great economic importance.

It is not easy to give specific advice on correct loading for any one tractor. Ploughing is the most difficult problem because the power required is affected by width, depth, speed and type of ploughing as well as soil type and condition. Under heavy land conditions a 100-horsepower tractor may be fully extended pulling four 14 in. plough bodies at less than 2½ m.p.h. and just over 9 in. deep. A tractor on light land may plough five 14 in. furrows at as

much as 6 m.p.h. and not be fully extended. There is a considerable demand for ploughs suitable for use at high speeds to utilize high powers without carrying an impossibly large number of plough bodies. The draught of most plough bodies rises sharply with increase in speed and in some cases may nearly double between two and five miles per hour. The extra work done on the soil by the plough bodies may save extra cultivation later and so be of value but in many cases this will not be so. Suitable disc harrows to give full loading for large tractors pose a problem since the draught of discs under most conditions is not high. Large tractors can easily handle 16 ft width or more, the implement then costing around £750. Equipment is available for hydraulically mounting a pair of smaller implements but this arrangement again increases the capital outlay. An excellent range of tined cultivation implements is available for the large tractors; providing a full load is not a problem.

If the economics of large and medium tractors are to be fairly compared, it must be on the basis of suitable implements for both types. This means not only more expensive horsepower for the large outfit but more expensive implements per unit of width worked.

Cost and output

Costs can be separated as depreciation, repair, and fuel and lubrication. We know most about fuel costs, which are very closely related to power output and do not vary very much from one make and size to the next. Lubrication costs are only a very small part of total tractor cost and for the purpose of this article are therefore not important. The remaining items are more difficult to forecast. Depreciation is, for all practical purposes, the difference between purchase and sale price. This difference can be markedly affected by the popularity of any one model—a factor which may not be known at the time of purchase. The model may become obsolete and because of that lose value quickly. In the absence of information on any one model the depreciation must be taken as a fixed proportion of the capital cost of the tractor; the fixed proportion would be the same for any tractor. Actual repair costs are similarly difficult, but one would expect that a more expensive tractor, for the same horsepower, would be of better construction and therefore have lower repair bills. This has not yet been confirmed in practice and repairs have to be taken as proportional to the initial cost of the tractor for a given number of hours annual usage. This amounts to about 10 per cent of cost price for 1,000 hours annual use.

The costing of labour is complicated by peak work periods and, therefore, 'opportunity costs'. If labour could be taken at, say, 10*s.* an hour it would be easy to calculate the point at which the large tractor became profitable. The 65 horsepower tractor appears to be cheaper up to about 750 hours work per annum and is undercut by the 100-horsepower machine beyond this point. But labour at peak periods may be so scarce that a large tractor could save a full-time man. Under these circumstances, whatever the number of working hours involved, the large tractor must be a sound investment.

The work output of the large tractors is proportionally similar to that of smaller machines. Under average conditions two-wheel drive tractors of 65 or 100 horsepower will each transmit rather more than 40 per cent of the bare engine horsepower into useful field work and under some conditions they may achieve considerably more than this. Four-wheel drive tractors of any size will have the capacity to work under more difficult ground

A typical type of large tractor that is in general use on our farms today

conditions and therefore have a longer working season which, in many cases, is equivalent to extra horsepower on the farm.

There are many alternatives available where extra farm power is required. It has been pointed out that large tractors are generally expensive per horsepower purchased. Cheap extra horsepower is made available by a turbocharger which can be fitted to some standard tractors to give 15 per cent or more extra power. There may be some snags as regards the warranty on the original tractor but there is no evidence, as yet, that the life of the tractor is, in fact, shortened.

Some farmers have made up a coupling so that two tractors may be used in tandem. This unit will operate under difficult soil conditions and therefore extend the working season. The cost of the coupling is not great and the unit can be used as two tractors again with a minimum of alteration. The front tractor in fact may be used without any alteration. A more expensive version of this is, of course, the purpose built four-wheel drive conversion which again extends the season and gives higher draught possibilities than two-wheel drive machines.

Summary

On the larger farms there is undoubtedly a case for using wheeled tractors of 100 horsepower or more. The lower acreage limit may occasionally be below 500. Labour output in acres covered per man will be roughly proportional to tractor horsepower. Depreciation and repair costs will be roughly proportional to capital cost—all of which are higher, per horsepower, for the larger machine. Fuel costs are much the same for the same amount of work done by any tractor.

There are many farms where more than enough power is already available and where labour cannot be reduced. Even though these farms are of substantial acreage the introduction of large tractors will increase rather than decrease costs.

Working rates are easy to establish by trial on the farm. Labour requirements can be worked out. Comparative costs, based on capital cost of the tractor and associated equipment can be arrived at, and the errors that may

come in here will not have too serious effect on the final decision. The two questions that must be posed are (*a*) are the existing tractors fully employed and (*b*) will the introduction of a large tractor genuinely save labour or result in a higher crop return?

This article has been contributed by **J. B. Finney, B.Sc.(Agric.), Dip. Agric. (Reading), N.D.Agric.E.**, who is Mechanization Adviser for the N.A.A.S. in Berkshire and Oxfordshire.

Tax in perspective

The Capital Gains Tax

G. H. Camamile and E. S. Carter

Short term gains and capital gains

THERE are two ways in which an individual may be charged to tax on his 'capital' gains: by the short-term gains tax and the capital gains tax. The short-term gains tax was originally introduced in 1962, with a different time basis, so that it applied to disposals within three years of acquisition, for land, and within six months for other assets. In the changes introduced in 1965, the period for all short-term gains (of assets acquired after 6th April, 1965) was fixed at one year.

Short-term gains are charged at ordinary rates of income tax and surtax. Capital gains are chargeable at a flat rate of 30 per cent or, in the case of individuals, under an alternative basis of charge by which, if it is to the taxpayer's advantage, his gains are taxed as if one-half of the gains for a year up to a maximum of £5,000 (and the whole of any excess over £5,000 was additional unearned income for the year).

No distinction is made in the case of a company between long and short-term gains and all chargeable gains are subject to corporation tax. Such gains are not, however, regarded as distributable income for the purposes of calculating a close company's required standard of distribution.

In principle the gains tax is charged on the disposal of a chargeable asset, upon the difference between (1) the consideration received for the disposal, less the costs of that disposal, and (2) the costs and expenses of acquisition of the asset. Also deducted from a chargeable gain is any amount spent by the taxpayer to enhance the value of the asset, provided that the expenditure is reflected in the state of the asset at the time of disposal. In addition, any

expenditure on establishing, preserving or defending the title to the asset is deductible.

The gain is treated as accruing in the year of assesment, in the case of an individual, or in the accounting year, in the case of a company, in which the disposal occurred.

Disposal—long-term gains

The word 'disposal' has a wide meaning for the purpose of the long-term gains tax because there are many circumstances in which tax is charged as if there had been a disposal—'deemed' disposal.

'Disposal' for this tax therefore not only includes sales, partial sales and gifts, but also an assumed disposal of all the assets owned when a person dies. There is a 'deemed' disposal of all trust assets at intervals of fifteen years in the case of settlements, where there is no life interest in possession: where there is a life interest in possession the occasion for a charge is the termination of the life interest, subject to a minimum interval of fifteen years.

Assets held at 6th April, 1965, only—time apportionment

The capital gains tax applies only to gains so far as they accrue after the introduction of the change on 6th April, 1965. To effect this limitation in the case of assets owned at that date (other than quoted securities), the gain is treated as having accrued evenly over the period of ownership, and a time apportionment formula is applied to calculate the chargeable proportion of the gain. Ownership is treated, however, as never having started any earlier than 1945.

Thus, if a gain is realized by a disposal on 6th April, 1967, of £2,200 and the asset is one which the taxpaper has owned since, shall we say, 1935, the apportioned part of the chargeable gain is $\frac{2}{22} \times$ £2,200 or £200. The period before 6th April, 1965, is thus restricted to 20 years for the purpose of this calculation.

The calculation becomes more complicated where there has been subsequent expenditure on the asset, which is reflected in the asset at the date of disposal, but the principle remains the same.

Election for valuation at 6th April, 1965

The time apportionment formula is not the only means by which the chargeable proportion of gains is limited to that which is attributable to the period after 6th April, 1965. A person or company who disposes of an asset which has been owned since before 6th April, 1965, may, subject to certain provisions, elect for the tax to be assessed as if the asset has been acquired at its market value on 6th April, 1965.

There has been some misunderstanding by taxpayers generally of the way this market value provision works. An election for valuation on 6th April, 1965 is a matter of choice for the taxpayer. It is important to remember tha any such election is irrevocable, and once the choice has been made the taxpayer cannot then say to the Inland Revenue that he wishes to apply the time apportionment formula.

If the result of the election is to show a loss instead of a gain, the asset is treated as though it had been disposed of for a consideration such that neither a gain nor a loss arose.

Where land having a development value was bought before 6th April 1965, the valuation method, as for quoted securities, is, however, obligatory. Where Betterment Levy applies, the levy paid will be deductible in computing any short-term gain. The capital gains tax charge will be based on changes in current use value only.

Relief and exceptions

Retirement. Reliefs are available under certain conditions where a taxpayer over 60 years of age transfers his family business, or his shares in a family company, to others when he retires. The relief tapers at the rate of £2,000 a year (with a corresponding fraction of £2,000 for any odd part of a year) from £0 at age 60 to a maximum of £10,000 at age 65 or above.

Death. On death the first £5,000 of any gains on the deemed disposal on the occasion of a taxpayer's death are excluded, less any excess over £5,000 of any relief on retirement.

Replacement of business assets. Where business assets are sold and replaced, any gain on the sale can be held over to the extent that the proceeds of sale are used to buy the new asset, provided that it is of the same kind of category as that sold.

Dwelling house and dependant relatives

The main or only house is exempt, except for any part used exclusively for business purposes, and a house provided rent free for a dependant relative is exempt.

Chattels selling for less than £1,000 are exempt, and there are many other specific exceptions—timber among them—and, of course, motor cars.

Transfers between certain people—between husband and wife, and, subject to various conditions, between company members of a group do not incur a charge to gains tax: in effect, the transferee is for gains tax purposes in the shoes of the transferor. A sale of a business to a company, as a going concern, is also an exempt transaction, if the conditions are fulfilled, but this may not be easy.

General considerations

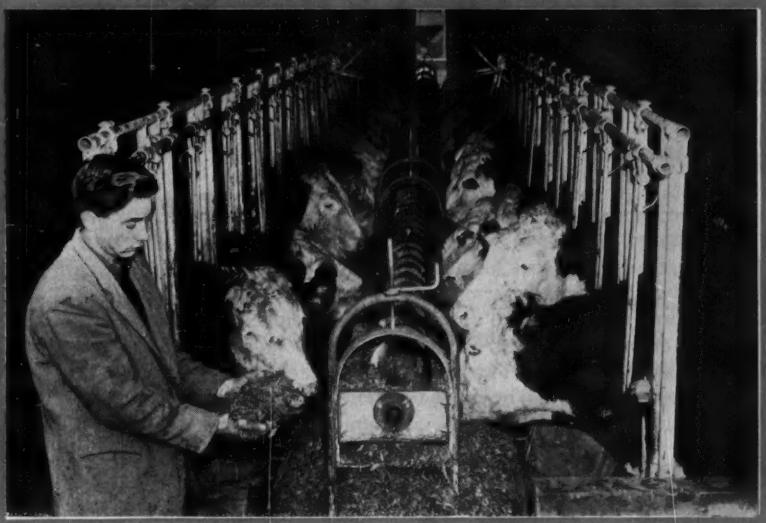
What is perhaps more important than the special rules which apply to the various circumstances in which capital gains arise are some of the general principles which must be borne in mind because this new tax has been introduced.

The real burden of the capital gains tax will only be felt in the future and in planning the continuity of a family business, it is a factor to be taken into account in the coming years together with estate duty, which many family businesses have had to deal with in the past.

Disposals may be deemed to take place, where there is no actual sale and where there is no new cash coming into the family or business unit, all or part of which is the subject matter of the deemed disposal. It is important, therefore, before embarking on any major decisions affecting the structure of a business to consider whether capital gains tax may be a material factor.

We can recommend the two very well written Inland Revenue leaflets which have recently become available on this subject (No. C.G.T.1) *How to calculate your gain*, and (No. C.G.T.2) *Quoted shares and securities.* They are no substitute for good professional advice, but they may help you to understand the subject matter. More comprehensive cover of the subject is given in the Inland Revenue booklet No. 560 (1966), *Capital Gains Tax.*

Feeds and Feeding



Feeding a ration of maize silage and supplement to beef cattle at Harper Adams

This feature on a topical subject contains articles by

★ **R. G. Mortimer, B.Sc. (Hons.), Wales M.S. (Michigan)**, who is a Senior Lecturer in Farm Management at the Harper Adams Agricultural College. He studied mechanical feeding in the U.S.A. as a result of which he has lectured in Eastern Europe on the developments in mechanized feeding

★ **J. R. Hopkins, B.Sc. (Hons.)**, took his degree at the University College of Wales, Aberystwyth. In 1957 he joined the National Agricultural Advisory Service, since when he has been a Nutrition Chemist in the West Midland Region, stationed at Wolverhampton

Mechanized Feeding of Livestock

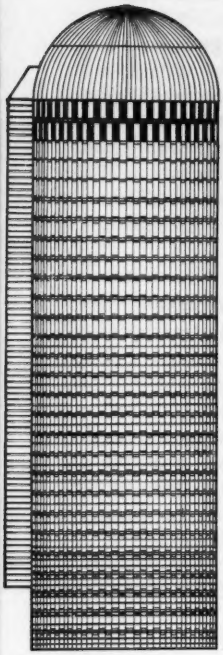
R. G. Mortimer

A REVOLUTION in livestock farming, comparable to the advent of the combine harvester on the arable farm, is taking place on British farms with the introduction of mechanical feeding systems. Impetus for the swing-away from the older hand or barrow feeding methods is the two-fold need to cut labour costs and the greater importance attached to producing a higher quality conserved feed. The latter is essential if mechanized feeding systems for beef and dairy cattle are to be economic under British conditions.

Tower silos

A key piece of equipment in mechanized livestock feeding is the tower silo. Small capacity models were erected in the 1920s in Britain but these went out owing to the amount of labour involved in filling and unloading. Silos ranging in capacity from 100 to 700 tons have been erected in recent years for these tasks. Tower silos are used for storing high dry matter silage (30–40 per cent dry matter), moist barley (20–30 per cent moisture content) and more recently whole crop cereals (cereals cut at the 'cheesey' ripe stage). Some models have been adapted for storing liquid slurry and farmyard effluent. Steel or concrete are the main materials used for construction although fibre glass models are available. Silos range in diameter from 14 to 30 ft and 20 to 85 ft in height. Generally the smaller steel silos are used for conserving moist grain and the larger concrete or steel silos for storing high dry matter silage. Research at various centres in England has shown that storage dry matter losses are between 5–10 per cent with towers, compared with 20–30 per cent with horizontal or bunker silos.

Filling the silo is undertaken by either forage blowers or elevators. Both hopper and tray models are used. Most are driven by p.t.o. drive from tractors but electric motor-mounted models are available. Filling a hopper blower from a forage box presents no problems, but where two- or four-wheeled trailers are used a 'dump box', which is similar to a stationary forage box with floor slats and beaters, conveys the tipped forage to the blowers. Filling rates of 30–40 tons an hour are possible with most blowers. Mechanical spreaders are available and one top unloader spreads the silage evenly by operating in reverse when the silo is filling. Covering with a plastic sheet when filling ceases is essential, also when the silo is filled some means of weighing down the top layers of silage should be used to prevent wastage.



THE NAME FOR MECHANISED LIVESTOCK FARMING

COLMAN

A complete system planned by experts

As pioneers in the development of mechanised storage and feeding systems Colmans have unrivalled experience, and supply everything from a simple bale elevator to a complete Concrete or Steel Silo installation—or a selection from the range to suit your requirements.

Write now for details of consultancy service, finance plan and grants to:

COLMAN & CO. (AGRICULTURAL) LTD.
Colman House, East Street, Sudbury, Suffolk

Tel. Sudbury 2399 Telex 98222

a member of the COLMAN group of companies

Unloading silos

Tower silos are unloaded from either the top or the bottom. For effective operation of all types the material in the silo, in addition to being evenly filled, must be cut fine and uniform ($\frac{1}{2}$–$1\frac{1}{2}$ in. is desirable) and be wilted to between 30 and 40 per cent dry matter.

The majority of the top unloaders are suspended above the silage by means of cables attached to a tripod or similar arrangement in the dome or roof of the silo. The operating principle is very similar with most models. A single or double set of augers which rotates around the silo cuts or 'teases out' the silage and conveys it to the centre. It is then blown through a chute or conveyed across by an auger to a series of openings down one side of the silo. The silage then falls by gravity through an outside chute to the base. A recently-introduced top unloader developed in this country incorporates 'coal cutting' principles rather than augers, and output with this type is higher than with conventional U.S.A. designed unloaders.

One unloader more widely used in larger diameter silos combines both top and bottom unloading features. Instead of discharging the silage through the side openings it drops the material, after it is collected by twin augers, down a central tube, formed during filling by drawing a metal torpedo up through the centre of the silage. This is attached to the unloader which, operating in reverse, also helps to level out the silage. From the bottom

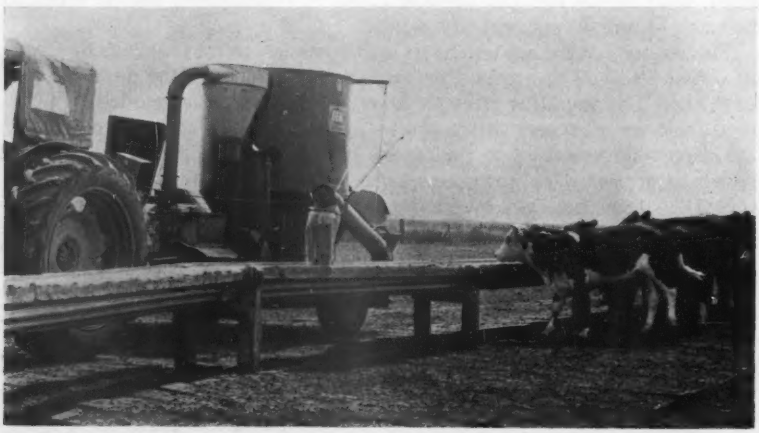
of the tube, the silage is conveyed by a chain and slat conveyor through the bottom door opening to another elevator conveyor.

Output rates for most top unloaders with grass silage range from 3 to 4 tons an hour but the 'torpedo' and the British 'coal cutter' systems will operate successfully at rates of 5–8 tons an hour. All unloaders have higher outputs when handling maize silage or a friable material such as whole crop cereal silage compared with more densely packed grass silage. Feeding from the silo can be undertaken either by forage boxes or by conveyors.

Forage augers

There are two main types of forage auger, the open and the tube feeders. The earliest and simplest feeder consisted of an open auger running on a hardwood or some other form of bearing raised above the feed manger. Filling the manger depended on a build-up of the material at the one end. As this reached the auger the rest of the feed would be conveyed along the rest of the manger. The amount of feed would be regulated by adjusting the height of the auger above the manger floor. A screw adjustment was provided at each 10 ft section. A modification to this simple type encloses part of the auger in a metal sleeve in a 'U' or 'J' shape. The 'U' shaped has set openings along the base. Both this and the 'J' shaped allow the material to be discharged along the whole length of the manger. Further modifications, using diverting boards, allow feed with some models to be distributed to either side of the manger or simply along the centre.

The tube feeders have the auger enclosed in a tube with set openings along its length. These are located in such a way that even feeding takes place along the manger. Tube augers are preferable for mixtures of silage and cereals. Most augers are supplied in 10 ft lengths, and up to 120 ft can be driven with one motor. Power requirements range from $1\frac{1}{2}$ to 2 h.p. for 50 ft runs up to 5 h.p. for 120 ft runs.



A mobile mill and mixer in use on an Essex beef unit

Where augers are being fitted into existing buildings it is often preferable to run shorter lengths of auger connected by a cross conveyor rather than one long length. This can enable different rations to be fed to different groups of cattle. The batch feeding method, in which a feeding area is fed by a relatively short length of auger and the various groups of cattle turned in for feeding, is another means of reducing the capital cost involved in an auger system of feeding.

Conveyors and forage boxes

Chain and slat conveyors are also being used and one feeder incorporates this system in conjunction with a tapered feeding bed. Power requirements are less with this than with auger and tube feeders and it also makes less noise when operating. Because of its tapering bed, however, it is limited to a length of 120 feet. There are two methods of feeding around the silo. The one conveys the feed by means of a chain and slat conveyor around the circular manger at the base and in the other the circular manger itself rotates around the silo.

Belt conveyors have not gained very much popularity to date for silage handling.

Forage boxes are more widely used on larger scale beef units. Filling the forage boxes takes time but where a series or battery of silos are in use this can be speeded up by unloading several silos at the same time. Feeding rate with all the methods depends mainly on the unloading rate, and a feeding rate of 30–40 minutes per 100 dairy cattle by augers and less by forage boxes is being achieved on British farms.

SPECIAL OFFER DURING OCTOBER AND NOVEMBER 1967

SIMPLEX ANNOUNCE UP TO 7½% PRICE REDUCTIONS ON FORAGE & WET GRAIN SEALED STORES

Simplex announce special Autumn price reductions on all their Forage and Wet Grain Sealed Stores. To qualify for these reductions firm orders must be received by our dealers, or at our Head Office by November 30th.

Low cost five-year finance available on all Sealed Stores. The Simplex MODERN FINANCE scheme enables you to purchase equipment at specially reduced prices and arrange the payment out-of-earnings up to a period of five years at only 4½% p.a. interest!

Contact your Simplex dealer now or write direct for full details of Simplex Forage and Wet Grain Sealed Stores available on these special Autumn reduced price terms.

Simplex OF CAMBRIDGE
ADVANCED FARMING EQUIPMENT

To: S. M. A. KNIGHT, SIMPLEX of CAMBRIDGE, Sawston, Cambridge. *Tel.:* Sawston 3281. Please let me have full details of your Sealed Forage and Grain Storage equipment and of the Simplex Finance Plan.

Name .....

Address .....

.....

A Member of the G.E.C. Group.

Costs

The economics of tower silos and mechanical feeding systems vary considerably, depending on the size of the unit and whether alternative use is found for the field equipment apart from silage-making. A typical cost for a 70–80 cow herd or 200–250 beef cattle could be:

Costs	£
Silo 20 ft × 60 ft (450–500 tons)	2250
Base	250
Total for silo including erection	2500
Machinery and Equipment	
Full-chop harvester	850
Forage boxes (2)	1200
Forage blower and ducting	300
Silo spreader	200
Top unloader	500
Conveyor feeder	450
Total	6000

i.e., £75 per cow for an 80-cow herd.

(No allowance has been made for Farm Improvement and other grants).

The forage boxes could be used to replace conveyor feeding and the field equipment could be used to fill 2–8 silos instead of the one. Similarly zero grazing could utilize some of the equipment during the summer.

Saving in labour and reduction in concentrates to offset this cost will vary. At present with manual 'push button' rather than completely automated, electronically controlled operation, being more common, the saving in labour could range from £500 to £1,500. Initially, because of mechanical failures, mainly due to using equipment designed for maize rather than grass silage, there was little direct saving in labour with some tower silo set-ups. However, more reliable equipment is now available and hence some saving should be made. To really justify these systems a considerable reduction in concentrate feed bills must be made. For an 80-cow herd a minimum reduction of £750–£1,000 would be needed. Several comparisons have been made between self-feeding and tower silo systems. The results have varied depending on the level of management achieved with both systems. Bridget's Experimental Husbandry Farm for the 1965 season recorded a cost of 1·5*d.* per lb of dry matter from towers and 1·8*d.* per lb of dry matter from self-feeding. Not all mechanized feeding systems depend on tower silos and other developments are taking place.

Improvement changes

The practice, fairly common in the U.S.A. and already adopted on some dairy beef and pig units in this country, of using portable mill and mixers for conveying grain and concentrate from bulk storage to hoppers in the feeding areas, is likely to increase. The method lends itself to joint or syndicate operation and could have an appeal for a group of smaller farmers, as well as fitting into larger units where cattle have to be dispersed around the farm.

An automatic calf feeder

Conveying dry meal or pellets in poultry and pig units presents few problems and many poultry units are already as automated as they are likely to be over the next five years. They may well increase in size however. The same can be said of some pig units where liquid feeding systems have replaced dry feeding of meal and cubes. The latter presents few problems and as with poultry units auger and tube feeders for filling hoppers or troughs are now well established. The liquid feeding technique is likely to extend further in piggeries as mixing and pumping problems are overcome.

Electronic feeding of either heated or cold milk substitute to young cattle, sheep and pigs, will occur as the equipment, at present available, becomes cheaper. Litters of lambs taken away from the ewes at an early age and reared on artificial lines will be used for far more intensive grazing systems than operate at present on sheep farms or for rearing and fattening indoors possibly on dried grass pellets or cubes. Earlier weaning systems with young pigs will also become the accepted technique before they move into indoor controlled environment fattening systems.

Looking back over the past five years dramatic changes have already taken place on some of our livestock farms. All the year round, indoor feeding of dairy cattle either from tower silage or straw and concentrate supplements is already practised on some farms. The next five years are likely to be even more dramatic as higher output machinery already considered essential on the arable farm, is applied to stock farming. However, to be economic, developments to save labour, by mechanical feeding, must also be designed to produce and handle quality feeds whether they be bulky such as tower silage or concentrated cubes or wafers.

Bulky Feeds

J. R. Hopkins

ANIMAL productivity is governed by the quantity and the chemical form of the nutrients supplied by the diet. The quantity of nutrients provided is governed by the intake and the digestibility of the diet. Experimental work has shown that in general the higher the digestibility potential of the food, the more quickly the digestion takes place and hence the faster the food passes through the digestive tract. Thus the digestibility of a food will influence both its unit value and its appetite potential. It has been demonstrated that in ruminant digestion the majority of the dietary carbohydrates are degraded by the microbes in the rumen to volatile fatty acids which are then absorbed and utilized by the host animal. The proportion of the various fatty acids that are produced are also related to the digestibility of the food: in general, foods of high digestibility tend to give a relatively high proportion of propionic acid whereas foods of low digestibility tend to give relatively less propionic acid and more acetic acid. Experimental work has shown also that both propionic and acetic acids can be used efficiently for maintenance purposes. However, propionic acid is used with much greater efficiency for growth, the production of milk protein and milk sugar; acetic acid is essential for the production of butterfat. Thus to achieve a high nutrient intake and high productivity it is necessary for the foods to have a high digestibility potential; however, a proportion of the less digestible carbohydrate is needed in the diet of dairy cows to ensure that satisfactory butterfat production is achieved. Conversely with stock in a low state of production, for example, dry cows and store bullocks, it is essential to include sufficient low quality bulky food in the diet so that the animal remains contented on its low plane of nutrition. From these general considerations it is proposed to examine some of the factors associated with grassland products which affect their intake and productivity by the animal.

Grass

The digestibility and hence the feeding potential of grass and grassland products has been shown to be primarily related to its stage of growth. Young spring grass, with an organic matter digestibility in excess of 70 per cent, has a high feeding potential and when fed to appetite can produce daily gains in beef cattle in excess of 2 lb and can sustain daily milk yields in dairy cows of at least 4 gallons. With dairy cows, however, the quantity of acetic acid produced from this type of food can be limiting and result in the production of milk low in butterfat. This can normally be rectified by supplementing the grass with 4–5 lb of a low digestible roughage such as mature hay or straw. As grass matures and passes the stage of ear emergence its digestibility and resulting feeding potential falls. Thus if a sward is to be maintained with a high production potential the headed material must be removed, so that it can be replaced by a vegetative regrowth with a high digestibility potential.

Although the feeding value of a grass sward is primarily governed by its stage of growth, there are a number of other factors in practice which can also affect the intake and production potential of the sward. Perhaps the most common of these is soiling of the pasture by the animals' excretia and also by soil contamination from their feet in wet weather. Work with bullocks during this season has shown that under wet conditions up to 40 per cent of the potential grazing of a pasture has been rejected for this reason. The nutrient intake from grass can also be reduced in the early and late part of the grazing season where the grass has a very high moisture content. This situation is not uncommon in the autumn when grass may contain up to 90 per cent moisture. Under systems of high nitrogen fertilizer usage a further hazard can arise under cold spring or autumn conditions by the accumulation of high levels of nitrate in the plant. These high levels of nitrate appear to reduce the palatability of the grass and where the animals are forced to consume it a loss of milk production and scouring is not uncommon.

Grassland conservation products

With the advent of the new and more efficient driers, dried grass is again being examined as a commercial method of grass conservation for the ruminant. Where the grass is dried in the long form its feeding potential will be similar to the grass from which it was made but, if the grass is milled after drying, the particle size is so reduced that a significant proportion of the material will pass through the rumen before the microbes have fully digested the cellulose fraction. This will result in the animal failing to utilize the full feeding potential of the product.

Most of the grass in this country is conserved as hay. The feeding value of hay is always less than that of the grass from which it was made. This loss in feeding value with the making will normally be proportional to the extent of the adverse weather conditions during the making process, but can be reduced by the use of a barn hay drying technique. This improvement in efficiency by barn drying is brought about not only by reducing time which the material is exposed to the weather, but also by a reduction in the leaf shatter effected by baling at the higher moisture levels. When hay is made badly and it becomes musty or mouldy its palatability and intake potential will be reduced. Further, it should be remembered that the presence of certain moulds in hay can bring about abortion when fed to cattle in late pregnancy.

Grass conservation in the form of silage is more popular on farms practising intensive grassland management. Its feeding value is again primarily governed by the feeding value of the grass from which it was made, but its appetite potential can be significantly reduced where the fermentation is poor. Under self-feed systems the intake can also be reduced where the silage is over consolidated, particularly when the grass was ensiled in the long form. Young, leafy silage is normally rich in protein and when fed in large quantities it is best supplemented with starchy rather than high protein concentrates.

Whilst the digestibility of the bulky food will determine its maximum production potential for any class of ruminant, this can be modified in practice by many other factors. It is important that these other factors are fully recognized and allowed for if efficient animal production is to be achieved.

Liquid Feeding for Pigs

R. A. Turner

LIQUID feeding for pigs at Walford was started in September, 1964, when we installed a package deal liquid feeding system. Having now used this technique for the past two years, it may well be that our results and observations on this aspect of pig production may prove of some value to those who are considering this system as a development within their own enterprise.

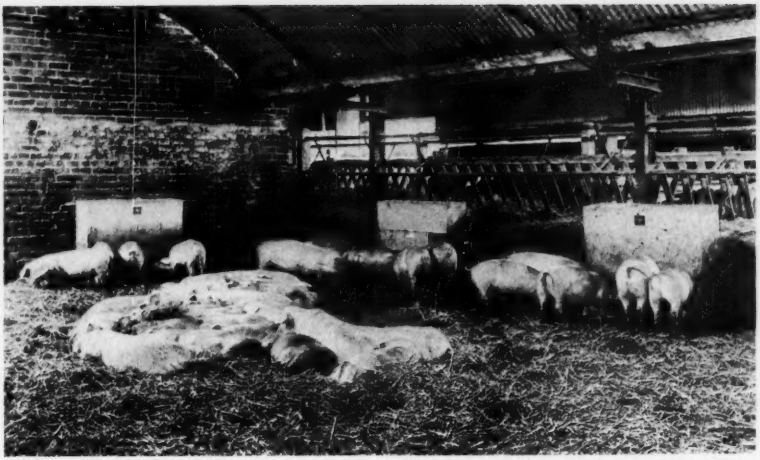
The pig unit at Walford is run as a commercial enterprise based on 100 pedigree Landrace sows and gilts with the progeny being fattened to bacon weight. The few pork pigs sold are those in excess of the housing capacity of the fattening accommodation comprising cheaply converted cowsheds.

Previous system

The management and feeding of the pig before transfer to the liquid feeding system is as follows. At three weeks of age the litter groups are weaned and run out on 1/10 acre paddocks according to the commonly used early weaning systems. Change-over from an early weaning pellet to a rearer type ration is effected between the 6th and 7th week of age. At 8 weeks, weighing an average of 41 lb live weight, the pigs are moved to covered yards, sometimes running with fattening cattle. Feeding at this stage until reaching about 120 lb live weight, since limited accommodation prevents it being 100 lb live weight, is *ad lib* on rearing meal. The fattening housing proper consists of 19 pens with a total holding capacity of 380 pigs up to bacon weight. All the pens have slatted dunging areas.

The change-over

The 1,200 gallon feed mixing unit and 600 ft of pipeline cost £750 inclusive of installation by farm labour in September, 1964. This unit is located in the lower floor of the farm granary some 50 yards from the nearest fattening pen. Food is transported via $1\frac{1}{2}$ in. diameter pipes to the pig trough into which food is released by opening a valve. Feeding from 120 to 200 lb live weight ranges from 4 to $5\frac{1}{2}$ lb per pig/day. No mechanical method is used to assess the amount of food that is fed to each pen of pigs. However, with a regular weekly check on the numbers and weight of pigs, the daily amount fed can be adjusted to an acceptable level of accuracy provided that commonsense is exercised by the pigman in distributing the total food mixed to the variously sized groups. Feeding is carried out twice daily, and whether one



A view of the pigs running in an open yard

mixes the ration once or twice daily there seems to be no effect on the pig either in acceptance of the gruel or performance.

Ration quality follows the traditional lines of reducing the level of digestible crude protein after 120 lb live weight. The ingredients included in our home-mixed rations have varied, since September, 1964, from a barley, wheat, soya meal, fish meal ration to the barley and protein balancer type ration now in use. Any ration change is based on the prevailing cost of the constituents.

The only vehicle that we have used for carrying the food through the pipes is water at the rate of 1 gallon to 4 lb meal. After experimenting with varying levels of concentration it was found that this proportion is compatible with the need for feeding accuracy, rate and evenness of gruel flow along the trough length so that each pig received its fair share and also the capacity of the pig for water intake.

Ease of operation

The task of transferring about $\frac{3}{4}$ ton of food per day to the fattening pens from the granary is now only a question of gravitational delivery of the ration ingredients to the mixing unit and turning one or two valves for each batch of pigs. This ease of operation allows ample time for the pigman to observe his stock. Unless the system has been installed incorrectly or abused, no problems, such as blockages, should develop. The question of abuse is relevant to the unit where the mixing inlet is placed at floor level for easy delivery of ingredients, since never before has such a convenient 'dustbin' been placed for the disposal of granary floor rubbish. Cleaning the mixer and pipeline can be very readily carried out since the food circulates round the whole system. It is doubtful whether washing is really necessary as the scouring action of the circulating food keeps the pipes and valves very clean. The only desirable cleaning is the external area around valves where food residues quickly grow moulds.

A close-up of the trough and feed piping

Health

Since the change to liquid feeding the incidence of respiratory troubles has almost been eliminated in the livestock. A welcome fringe benefit is that the pigman no longer breathes in large quantities of feed dust.

The dung condition of the pig on gruel feeding tends to be very loose compared with dry feeding, and is consequently less reliable as a guide to the health of the individual, although it has the advantage of rendering the slurry system less prone to blocking.

Performance of the pig

The food cost per lb liveweight gain (120–200 lb live weight) since the change-over has not altered and is at present 13·3*d*, which approximates to a cost of 11·5*d* per lb for a pig between 40 and 200 lb live weight.

The grading figures relevant to the period before and after the installation of the system are as follows:

Year	1963/4		1964/5		1965/6
Period	1	2	1	2	1
Percentage AA+ and AA	65·5	76·5	74·6	83·5	91·2
Baconers sold	194	277	323	400	537

Period 1 *October—March (inclusive)*
Period 2 *April—September (inclusive)*

The figures shown above would seem to indicate that rather than the expected depressing effect on gradings due to the accuracy of feeding being more dependent upon human judgment, an improvement has been brought about by the introduction of liquid feeding since it is unlikely that an improvement of the above magnitude could be due solely to breeding policy.

Killing-out percentage since the use of liquid feeding has not altered, and at present ranges between 74·3 per cent and 76·1 per cent. This we find interesting since on visual appraisal the present type of pig seems to have a larger belly than its dry fed predecessor.

Advantages

In conclusion, the system of liquid feeding that we have adopted has enabled us to increase output from our present buildings by making better

use of awkwardly shaped pens without any deleterious effects in respect of food conversion ratio or K.O. per cent. Moreover, it has improved the gradings and reduced the time and effort associated with feed distribution which, although not fully exploited on our size of enterprise, does make more time available for the practice of good stockmanship. It also places the type of work involved on a par with the better working conditions enjoyed in other industries.

This article has been contributed by **R. A. E. Turner, N.D.A.,** who is lecturer in agriculture at the Shropshire Farm Institute, an appointment which he accepted after leaving Seale-Hayne Agricultural College.

The Ministry's Publications

Since the list published in the October, 1967, issue of *Agriculture* (p. 501) the following publications have been issued:

MAJOR PUBLICATIONS

Technical Bulletin No. 14. Soil Potassium and Magnesium (New) 40*s.* (by post 41*s.* 4*d.*)

Experimental Husbandry Farms and Experimental Horticulture Stations. Eighth Progress Report 1967 (New) 8*s.* (by post 8*s.* 6*d.*)

Dairy Floors. Report of the Dairy Floors Sub-Committee of the Milk and Milk Products Technical Advisory Committee (New) 8*s.* (by post 8*s.* 6*d.*)

FREE ISSUES

ADVISORY LEAFLETS

No. 26. Pear Midge (Revised)
No. 391. Preparation of Strawberries for Market (Revised)
No. 434. Home Freezing of Fruit and Vegetables (Revised)
No. 485. The Pollination of Plums (Revised)
No. 489. Mites in Stored Commodities (Revised)
No. 504. Seed Potato Sprouting (Revised)
No. 534. The Rabbit (Revised)
No. 543. Black Currants (Revised)

SHORT TERM LEAFLETS

No. 60. Field Beans (Revised)
No. 68. Practical Pig Feeding (New)

The priced publications are obtainable from Government Bookshops (addresses on p. 554) or through any bookseller. Unpriced items are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

Seed Potatoes

R. B. Mair *Director, High Mowthorpe Experimental Husbandry Farm*

GROWING seed potatoes is a highly specialized enterprise, with objectives markedly different from those of successful ware production. Put simply, the prime objective is to produce a lot of medium-sized tubers, which are free of disease, whilst the ware grower is mainly interested in producing a heavy weight of large tubers.

In England and Wales seed production is largely confined to a few upland areas, where the climate and isolation from sources of potential infection combine to limit the spread of virus diseases. The two most important of these diseases, leaf roll and severe mosaic, cause deterioration in a potato stock both by the spread of infection within the crop and by contamination carried between crops by aphids. In lowland ware growing areas the rate of deterioration, that is the rate of increase of plants affected by severe virus infection, in a stock of potatoes where seed is saved for growing on the following year, can be unpleasantly spectacular. A figure of a five-fold increase annually is frequently quoted. This means that starting with a seed stock containing an average of one diseased plant in every two hundred, the maximum tolerance for leaf roll and severe mosaic in a certified 'A' seed stock, where no control measures are taken, 2½ per cent of the plants will be infected in the following year if the seed is grown on. If saved for a further year, 12½ per cent of the resulting crop could be diseased. The results obtained from a crop grown from seed saved from this heavily infected stock would be completely disastrous.

The main agents in spreading virus diseases in potatoes are aphids, or greenfly, the most important species being *Myzus persicae*, the peach-potato aphid. These sap-sucking insects spread infection by moving from diseased plants on to healthy plants, and although the plants seldom show symptoms of disease in the season they are infected, they produce tubers carrying the virus. If planted in the following year these tubers then produce plants showing symptoms of the particular virus disease but these will lack the vigour needed to produce a worthwhile crop.

Although the use of systemic insecticides, on crops where seed is to be saved for growing on, can reduce the rate of deterioration in crops grown in ware-producing areas, efficient ware production is still based on obtaining high quality seed from the specialized grower. Scotland is the traditional source of high grade seed, but competition from seed-growing areas in Northern Ireland, the Isle of Man, England and Wales is increasing.

Maintaining health

Exposed windy conditions limit the activity of aphids, and the centres of seed potato production are therefore found in upland or coastal areas. In England and Wales the main seed-producing counties are Cumberland, Durham, Yorkshire, Gloucestershire, Brecon and Radnor. High Mowthorpe Experimental Husbandry Farm is situated on the Yorkshire Wolds, where certified 'S.S.' and 'A' seed is produced on land above the 400-ft contour. Each year some 70 acres of potatoes are grown for seed on the farm. The method of operation is fairly typical of the areas, a small quantity of Foundation Stock or Special Stock seed being purchased each year. This is then grown on for two or three years before being sold to ware producers.

The prosperity of a seed-growing enterprise will ultimately depend on the grower's ability to maintain a reputation for regularly supplying vigorous healthy seed. Any breakdown in his ability to do this will result in his customers turning to alternative sources of supply. The seed grower must therefore do all that he can to ensure that the health of his stocks is not contaminated.

Isolation in time is equally as important as isolation by location. The legal requirements for 'S.S.' or 'A' seed specify that the land must not have carried a previous potato crop for four clear years, but to ensure freedom from 'groundkeepers' most growers prefer a longer rest between crops. A long rotation is also essential to ensure continued freedom from potato root eelworm. The spread of virus infection within a crop, by infected plants contaminating their healthy neighbours, can be controlled by early roguing. All plants showing disease symptoms should be removed and destroyed at the earliest opportunity. It is not sufficient to pull out the tops and leave them on headlands, as these methods provide possible sources of infection. When done properly, roguing is a time-consuming job, but the operation is one of the essential costs of good seed production.

Burning-off

Destroying the tops in late July or early August is a practice usually recommended as a means of controlling tuber size and preventing late virus infection of the crop. When coupled with an early warning system, so that seed growers are informed when infective aphids migrating from ware-growing areas may be invading their crops, the early destruction of the haulm is an excellent measure of disease control. The N.A.A.S. entomologists now provide this type of warning service to seed growers. Several chemicals have been tried for haulm destruction, but contract spraying with sulphuric acid is still preferred as the most effective method, being quick and relatively trouble-free.

Trials at High Mowthorpe have shown, rather surprisingly, that burning-off the haulm in early August has little effect on the eventual yield of seed-sized tubers, 1¼–2¼ in. The total yield on experimental plots was reduced by an

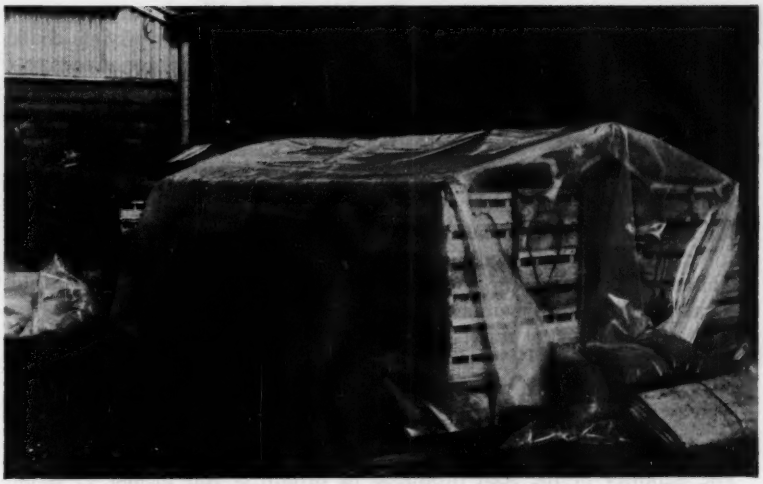
average of 1·8 tons per acre when burning-off early, but this reduction was largely due to a loss of ware sized tubers. Such a reduction in total yield, without the compensation of an increase in the weight of the more valuable seed fraction, represents a potential loss of around £30 per acre in gross output, due to early haulm destruction. Nevertheless seed producers must be prepared to accept this loss of output in the interests of good crop hygiene. Fortunately early burning-off often provides an additional compensation, in that it allows an early start to be made in harvesting. In seed-growing areas like the Yorkshire Wolds, winter often sets in early and late harvesting can mean that wet cold conditions result in severe handling and storage problems.

Chitting

The weather conditions that curtail the activity of aphids also tend to produce a short growing season; it therefore becomes vitally important to get the crop away to a good start. Planting too early, when ground conditions are cold and wet, is unlikely to increase yields as diseases, such as skin spot, tend to cause the resulting crop to be gappy and uneven. Late planting will reduce total yield, although a good seed yield can still be obtained. At High Mowthorpe mid-April appears to be the optimum planting time in most years, but some spread of planting is unavoidable.

Potato lifting on plots at High Mowthorpe E.H.F.

Chitting the seed gives an economic return in most seasons, particularly if planting is delayed, and facilities to sprout at least a proportion of the seed to be planted, are an advantage. Unchitted seed should be planted first and the later plantings made with the sprouted seed. Care must be exercised to control the length of sprouts produced, particularly if an automatic planter is to be used. Buildings for sprouting seed need not be elaborate and costs must be kept down. Recent investigations into the use of polythene covered stacks of seed boxes, placed in sunny, sheltered corners of a farmyard, suggests that permanent facilities are not essential to obtain the major advantages that sprouting can bring.



Chitting under polythene. Photograph shows soil warming cable in position for frost protection

Planting

The weight of seed planted for seed production is normally between 30 and 35 cwt per acre. The optimum size of seed to be used and the best planting distance are closely inter-related factors, the most profitable combination depending on the purchase price of the seed and the eventual sale prices of seed and ware. A high weight of seed per acre, achieved either by planting large seed or by close spacing, will increase both total yield and the proportion of seed in the resulting crop. At High Mowthorpe increasing the seed rate by one ton per acre has produced an average increase in the gross output of just over £30 per acre. A high seed rate was, however, only economic in years when seed for planting was relatively cheap and the resulting crop was sold at high prices. The seed producer therefore needs to be supplied with a reliable crystal ball to determine his optimum seed rate. Rough sizing into large and small seed is a useful compromise, planting the smalls at 9 in. and the larger sets at 12 or 15 in. This practice helps to keep costs down and takes some of the guesswork out of planting.

Fertilizing

No standard fertilizer requirements can be given to cover all situations. Of the three main plant nutrients, nitrogen has the least effect on the yield of seed; in most situations an application of approximately 100 units would appear to be optimum. The position with regard to phosphate and potash is complicated, as these two elements have a complementary effect. A high level of potash is often required to obtain maximum yield, but by increasing tuber size produces a low proportion of seed. This is particularly true when high levels of muriate of potash are used and there may be a case for using sulphate of potash on seed crops.

Where soil analysis indicates that a high level of potash is required an increase in phosphate is also advisable, as phosphate tends to increase the proportion of seed in the resulting crop, and thus modifies the effect of the

potash. With fertilizer spread over the ridges before planting the optimum dressing at High Mowthorpe, on a silt-clay loam soil overlying chalk, proved to be 100 units of N, 140 units of P and 240 units of K for a seed crop. These quantities will require modifying for other circumstances according to the soil type, method of application and the amount of farmyard manure applied.

Weed control

The main factors in determining the best method of weed control, in a seed crop, differ little from those governing the choice in ware production. Chemical control can be effective, but is likely to be more expensive to use than cultivations on farms where adequate manpower and suitable machines are available. Experimental results are inconclusive and the choice between the two methods is likely to be decided more on factors of farm organization, than on purely technical considerations.

Harvesting

The majority of the seed produced in Britain is still picked by hand. Flints, stones and wet conditions in upland areas during harvest, often make machine harvesting costly and unreliable. It is, however, the fear of excessive damage that is the controlling factor. Damaged tubers may develop a host of complaints during the long enforced storage period between harvest and next years' planting time; damage must therefore be kept to a minimum. A complete harvester that will cope with bad conditions, without causing undue damage, is eagerly awaited, but the majority of seed growers remain unconvinced that such machines are available. The handling of the picking gang, or the searching for reliable pieceworkers, remains as just one more headache for the grower to cope with in the specialized, complicated and yet completely enthralling business of seed potato production.

This article has been contributed by **R. B. Mair, B.Sc.,** who is Farm Director for High Mowthorpe Experimental Husbandry Farm, Duggleby, Malton, in the East Riding of Yorkshire.

Binder for 'Agriculture'

As a result of a keen interest shown by many of our readers in purchasing a binder to hold their copies of 'Agriculture,' we are now pleased to say that such a binder is now available.

The binder comprises two stiff covers bound in dark green material and joined together by a spine covered in similar coloured leatherette on which the title 'Agriculture' is embossed in gold lettering. It holds twelve copies of the journal.

The price of this binder is 12s. 6d. (by post 13s. 8d.) and is obtainable from H.M.S.O., P.O. Box 569, London S.E.1, Government Bookshops (*addresses on p. 554*) **or through any bookseller.**

As it is anticipated that the demand for this binder will be great, it is advisable to place your order early.

5. Buckinghamshire

G. C. R. Gibson

BUCKINGHAMSHIRE is a county 70 miles long, only 10 miles wide at its waist—where the town of Aylesbury lies—with farming systems in the north influenced by the eastern counties and the midland shires, and in the south by the Thames Valley and London. The latter, with its high urban population and commuters provides opportunities for the direct selling of eggs, cream and horticultural produce.

The glacial and river gravels in the south and the scenically beautiful but hungry Chiltern Hills contrast sharply with fertile clay loams in the Vale of Aylesbury, famous for the summer fattening of cattle. In the west and north-west there are some badly drained, difficult clays, again contrasting with the more productive north-east.

Farmers and farming systems tend to follow this pattern of contrast, reflecting varying backgrounds and opportunities. Although traditionally a livestock county, Buckinghamshire has moved more recently towards an increased arable acreage and more cereals. It also has an important horticultural industry and a high poultry population.

The Roper family

The changes that have taken place over the years are also mirrored in the history of one of its best known farming families—the Ropers, of Lenborough, near Buckingham.

The great-grandfather of Richard Roper, who currently controls the freehold owner-occupied 1,067 acres at Lenborough, came from Suffolk in the 1830s as tenant of 250 acres near Buckingham. A high standard of husbandry and a readiness to adjust to changing economic circumstances are, no doubt, the main reasons behind an unusual success story. It has not been a slavish following of fashion, as evidenced by a herd of pedigree shorthorns, which would delight the eye of any stockman, whatever his breed preference. A roomful of silver, which includes awards from all the premier shows in the country, is sufficient proof of quality and performance. Furthermore, the herd will stand up to any searching economic test, with a herd average of over 1,000 gallons from 100 cows, milked in a modern yard-and-parlour by two men—300 gallons a day for most of the year. This is a remarkable achievement in productivity, even in these days.

All calves are reared, either as replacements or as heifers or bulls for sale and the rearing is the responsibility of one man. The steers are finished as premium quality beef at about two years old, further evidence of the all-round qualities of the herd and of the success of the breeding policy.

High stocking rate

In addition to the present 424 head of cattle, a flock of 320 breeding ewes is kept, the lambs being sold fat off grass. All the stock are kept on intensively farmed grass, part of which is paddock grazed. The overall stocking rate is 1·4 acres per livestock unit.

After coping with the variable quality of clamp and trench silage for 20 years, and after the disastrous hay harvest of 1965, a large barn hay drying unit was installed. In each of the past two seasons 200–250 tons of prime quality hay has been made. Most of the concentrates fed are home-grown and home mixed.

Intensive arable

The remaining 600 acres are currently cropped with wheat and oats, which are dried, handled and stored in a large automated system of bins, with a total capacity of 1,000 tons. These were all filled by early September of this year.

The range of modern machinery and equipment used to handle this large and intensively farmed acreage would attract any young man interested in farming. It is significant that Richard Roper is not short of labour. Almost all the staff have been with the family since they left school—one for 47 years —as proud of their skills and the standard of their farming as is their employer.

Since the last war, the farming system has been based on the 3–5 year ley, but once again adapting to changing economic conditions, and to maintain a 'healthy' wheat acreage, a system of two-year leys with beans and oats as additional break crops is being introduced.

Some reflections

For 70 years, until the second World War, the farming system was based almost entirely on permanent grass. The foundation of the existing dairy herd was laid during the first World War, graded and built up from carefully selected stock to its present standard, no female having been purchased for 53 years. This was largely the achievement of Mr. Corbet Roper, Richard's father, who, although in his late eighties, still has a lively interest in the farming at Lenborough. He recalls the time when milk was put on rail to London in barn gallons (17 pints) at from 1*s.* 3*d.* to 2*s.* 1*d.* per barn gallon.

A brief note is insufficient to reflect the achievements of the Roper family. Their farming operations embrace most of the systems which operate in the county at the present time, although obviously not all holdings have the same structural advantages, or the capacity to command the same capital resources, but this is no more than the rightful reward of farmers of this calibre.

A major economic feature of Buckinghamshire at the present time has its origin in the way farms were divided up by their original owners. They are now either too large or too small for present day needs. We can anticipate more changes in farming structure and capital investment in the future.

Low Cost Timber Buildings

T. V. Yabsley *Agricultural Land Service, Exeter*

The past ten years have seen a revolution in farm building construction and pointed the need for low cost structures involving the use of less or cheaper materials and/or labour. This article outlines some methods by which this might be achieved.

APART from the use of a standard design and module to enable full advantage to be taken of pre-fabrication and mass production methods, thereby reducing the need for costly site labour to a minimum, the choice of a material which is economical in price and versatile in use is important. Timber immediately suggests itself because it is readily available, easy to work, repair or alter; it is one of the lightest structural materials, yet stronger than most on a strength/weight ratio, has good insulation properties and a long life if properly treated. Moreover, it is shock-resistant so not easily damaged and gives good fire resistance. It also has good salvage value.

Timber has long been in use for building and whereas at first strength was achieved by excessive size, research into its properties has enabled economic use to be achieved by relating dimensions to stress. Stress grading according either to British Standards Code of Practice 112 or B.S. 1860 (Part 1) is now quite common.

While on strength/weight and strength/cost ratios, timber is superior to steel in tension, bending and stiffness. It is inferior in direct compression and shear, so needs to be adapted to the techniques involved in the development of steelwork and reinforced concrete design by the use of built-up girders, plywood, modern adhesives for jointing and connectors.

The use of nails, screws, pegs and bolts as connectors suffers from the disadvantage of giving a joint efficiency of only 15 per cent due to the difficulty of fixing a sufficient number to the contact area, the low resistance to shear stress parallel to the grain and the non-uniform distribution of bearing stress along the nail, bolt or screw.

It is surprising that so few realize that the addition of connectors to bolted joints in the form of washers with spikes, teeth or corrugations which force into the joined faces or plain rings which fit into pre-cut grooves will increase efficiency to 70–80 per cent or even to 100 per cent with adhesives.

Modern glues, which are resin-based, to B.S. 1203 and 1204 overcome the failures of earlier types of glue since they are strong, durable, and water and micro-organism resistant.

The use of plywood for built-up timber girders, gussets in portal construction and stressed skin construction if used as load-bearing components with timber stiffeners between the sheets, is both economic and satisfactory since it gives high strength in both directions and as there is no through grain it does not suffer from splitting. Small defects have little effect over a whole sheet. Moreover it can be obtained in a range of convenient sizes, resin-bonded and treated with preservative.

Hardboards of suitable quality are available for similar uses to plywood. Building boards, however, possibly only have a limited use in farm buildings, chiefly as linings in suitable conditions.

The type of farm building probably best suited to the use of timber is one of framed construction provided intermediate supports are acceptable. Length is immaterial because bays can be added later as required but some care in deciding the width is needed. In the case of a building to house livestock, for example, a width should be chosen which will permit the installation of a cubicle system if required. If bay spacing is changed from 15 ft to 8 or 12 ft, full advantage can be taken of plywood and building board sizes and provide a 24 in. module now common in the building industry.

Height above floor level should not be less than 8 ft to comply with B.S. 2053 but if loose housing is planned this should be increased to 9–10 ft.

Framed buildings prefer a level site. Use of a post-hole digger is desirable for excavation into which can be poured 6 in. of concrete to form a pad on which the stanchion should rest. The hole should be backed-filled with rammed earth. To eliminate constructional joints, twin timbers, spliced and married at eaves and apex with plywood gussets, connectors and adhesives should, wherever possible, be used for the framework. Galvanized corrugated iron (26 g. minimum) in long sheets and high tensile, to allow wide purlin spacing will be found to be an economic cladding for the roof which should be designed for a loading of 10 lb per sq. ft. For vertical cladding prefabricated timber panels sheathed with plywood, hardboard, flat or corrugated iron are recommended. Slatted $\frac{3}{4}$ in. boarding, spaced $\frac{3}{4}$ in. apart, is useful especially for gable ends and where ventilation is necessary. Spacing can, however, be varied to suit site conditions.

To sum up, timber, provided its use is planned and designed carefully and supplies, if necessary, are bulk purchased, can provide a versatile farm building at economic cost with a long expectation of life as well as one which will be easily adaptable to keep pace with the changing face of agriculture.

Changes in the Pattern of Agricultural Labour

A New Ministry Booklet

There are now more tractors on our farms than there are regular whole-time workers, whereas in 1945 workers outnumbered tractors by more than three to one. Between 1945 and 1965, while agricultural productivity rose considerably, the labour force decreased by 36 per cent. At the same time the occupational structure of the labour force changed and so did the structure of wages.

These are some of the facts given in *'The Changing Structure of the Agricultural Labour Force in England and Wales—Numbers of Workers, Hours, and Earnings, 1945-1965'* this new Ministry booklet. The price of the booklet is 17s. 6d. (by post 18s. 4d.) and can be obtained on written application to the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex, or by personal application to Room 8, Whitehall Place, London, S.W.1.

in brief

- **Dairying as a business**
- **Vaccination against brucellosis**
- **Barley and blotch**

Dairying as a business

THE increasing emphasis which agricultural advisers place upon good management as the touchstone of profitable farming is nowhere seen more appositely than in running a dairy herd. The pattern of the modern milk business in England and Wales has changed out of all recognition during the past ten years—with about one-third less producers controlling a substantially increased national herd under new conceptions of milking layouts and techniques. And we can be sure that spiralling land and labour costs will bring still further changes and innovations in the next ten.

It is in this climate of changing circumstances and the consequent need for flexibility and adaptation that the recent new issue of the Ministry of Agriculture's *Aids to Dairying Management** will be found so useful.

Whilst milk yields have in general gone up to an encouraging level, no one will deny the authors' contention that 'the average producer has probably not yet reached the limit of the genetic potential'.

Systems of dairying are largely determined by systems of feeding, whether, at one end of the scale, it is a high level of concentrates, or at the other, bulk feeding. Between the two extremes there are many permutations, and it is for each farmer to decide for himself which system is likely to put more milk in the pipeline and more money in his pocket. Size of farm, quality and type of land, climate, the buildings available and stockmanship are all differential factors affecting the gross margins per acre.

The cost of producing milk can be broken down into food 60 per cent, labour 20 per cent, miscellaneous 15 per cent and replacement 5 per cent. Better conservation, whether of field hay, barn hay or silage, and the wider use of the cheaper home-grown feeds, will reduce the food bill; a better layout of buildings, especially for milking and feeding, will make the best use of labour; and more intensive methods of rearing home herd replacements can reduce actual land requirements—and the latter is going to be an important point if the rising prices of dairy cows show no abatement.

Supported as they are by practical illustration, the pointers in this book to a viable dairy enterprise (and keeping it that way) will repay study. Applied to individual circumstances (and, it hardly needs to be said, with farm records as the guide), budgeting for productivity becomes a simplified exercise—and where is the dairy farmer who will not welcome that?

*H.M. Stationery Office, price 2*s. 6d.*

Vaccination against Brucellosis

ANOTHER stage in the prosecution of the long-term policy to eradicate brucellosis has been made by restricting the further use of Strain 19 vaccine. From 1st November, 1967, this vaccine will be available to veterinary surgeons only for use in the Free Calf Vaccination Service to treat cattle between 91 and 180 days old. Vaccination of adult cattle with S19 will no longer be permitted.

Many cattle react to diagnostic tests only because they have been vaccinated with S19 when over age. Given outside the ages to which the Free Calf Vaccination Service applies, S19, which is a live vaccine, produces long-lasting reactions to tests. A countrywide survey in 1964 found 14 per cent of cattle to be giving a positive reaction to the brucella test, and of these 12 per cent were believed to be false reactions due to vaccination.

The use under certain circumstances of Strain 45/20 dead adjuvant vaccine with adult stock will be available to veterinary surgeons. The use of any brucella vaccine in adult cattle in herds known to be heavily infected is of doubtful value, but vaccination of adults may be beneficial (*a*) where a herd is uninfected or a herd of unknown status appears to be free of infection but there is a heavy infection in neighbouring herds, (*b*) where heifers of unknown vaccination status (e.g.,unvaccinated heifers from Ireland) are brought into herds where infection from a previous outbreak may still exist, (*c*) where light infection is believed to be present in a herd, or (*d*) to reduce the risk of abortion in a known infected herd.

Strain 45/20 vaccine must not, however, be used in herds actually in the Accredited Herds Scheme, which is building up the reservoir of brucella-free replacements, nor must there be less than a twelve months period between the last use of S45/20 and admission to the scheme.

Farmers are urged to ask for full details on the use and restriction of use of these vaccines from the Ministry's Divisional Veterinary Officers.

Barley and blotch

A FEW years ago leaf blotch of barley, *Rhynchosporium secalis*, although recorded, was considered to be of little economic importance. Since then, however, we have seen an astonishing rise in the barley acreage and the practice of continuous cereal growing. Mr. F. R. Horne, Director of the National Institute of Agricultural Botany, spoke about this in his presidential address to the agricultural section of the British Association at Leeds on 'The Potentiality of Plants for improving Food Supplies'. He expressed the view that until cereal growers in the south and west of the country can obtain two-row varieties for spring sowing resistant to the blotch fungus, they may reduce their barley acreages. A serious attack could cause almost complete defoliation.

This warning emphasizes the importance of thorough stubble hygiene. The elimination of harvest residues, particularly shed grain, will do much to prevent the fungus being carried over to the next year's crop. Winter barley, at least of the two-row varieties (though not in itself a dangerous host of *Rhynchosporium*), can carry the disease over to spring barley, both on the same farm and to neighbouring farms.

Mr. R. G. Hughes, N.A.A.S. regional crop husbandry adviser, made this point at a farm demonstration near Newbury, Berks, recently, when he advised cutting out winter barley. 'Any drawbacks in dropping winter barley are insignificant against the advantages', he said. 'A break between September and March gives us a chance to clean up traces of the previous crop and also weed grasses. But it is no use one farmer doing this if his neighbour does not do the same. To be effective it must be carried out on a wider scale'. And that indicates group action.

Agric.

Books

The Economics of the Poultry Industry. ERIC S. CLAYTON. Longmans, Green, 1967. 36*s*.

What a welcome addition this book is to our limited literature on the economics of poultry production, both on account of its comprehensiveness—it deals with both eggs and poultry meat—and because it brings together, under one cover, the results of much basic research carried out by various workers in these fields.

This is essentially a teacher's book for agricultural students at all levels. It also introduces innumerable practical points, however, which are of great value and should be readily appreciated by poultry keepers and processors.

It is divided broadly into two sections. The first deals with the economics of producing and marketing eggs and describes the factors affecting the costs, returns and profits and the standards of efficiency. In addition, the interrelationships of demand, supply and price are examined, together with developments in production techniques and the problems of egg marketing. The second part deals with poultry meat production, with special reference to broilers, and certain aspects of marketing. It discusses thoroughly the factors affecting the present and future demand for poultry meat, as well as some marketing problems and the conflicting interests within the broiler industry. The results of research done in this field and some ideas put forward by Dr. Clayton should be most useful to those concerned with the production and marketing of table-birds. For example, it is shown that there is an optimum killing-weight which varies with changes in the prices for poultry meat and for feed; and that as a result conflicts can arise between producer and processor. The need for a market intelligence agency, and the pros and cons of integration, central control, and contract farming are all discussed.

Much of what is written is based on certain economic principles and the reasoning is, on the whole, set forth in simple language. Even so, there are several statements which could have been elaborated in the interest of clarity. An additional table here and there might have been helpful, e.g., to clarify an ambiguous statement in chapter 2 concerning the effects of the death-rate on cost, or to illustrate the author's reasoning about optimal hatching dates. Again he might well have devoted more space to the relative advantages of modern hybrids, pure breeds and more conventional crosses, both as first and second year layers. It is unfortunate that sufficient information is not yet available to have allowed him to discuss the economies of scale more fully.

It is necessary to point out one or two errors in Chapter 6: the tables on pages 85 and 86 refer to broilers and not, as stated in the text, to turkeys; and the wrong place of publication is given for the tables on pages 89 and 90.

The chapter on the application of farm management analytical and planning methods to poultry is very well presented and should be extremely helpful to the practical man as well as to all agricultural students. The chapter on operational research is particularly welcome. It considers how this new science can assist in lessening degrees of possible error and in speeding up decisions relating to many complex problems involved in poultry production and marketing. Finally, the carefully prepared appendices will be a direct aid to egg and broiler producers.

This is a well-written and useful book. The few criticisms which have been made do not detract from its overall value, and it is highly recommended to all agricultural students and practical men who seek and enjoy instructive as well as interesting reading.

W.D.J.

Le Marché Commun Agricole. FRANÇOIS CLERC. Presses Universitaires de France. 3f.

Although there are numerous articles and pamphlets in English or otherwise on the Common Agricultural Policy of the European Economic Community there is a shortage of books on the subject.

It is understood that the Oxford University Press will be publishing a book in English next spring. Meanwhile, for those who know French, there is this short very readable paperback book by Monsieur Clerc in the 'Que sais-je?' (What do I know?) series.

In 126 pages it is, of course, not possible to go into the matter deeply but the book

has the merit of being very nearly up-to-date. It is, in fact, the third edition and has been considerably revised to include developments up to early 1967.

Although the first part covers to some extent the theory and background of the C.A.P., the book is for the most part a descriptive account and leans heavily on published and unpublished documents of the European Economic Commission. The author has not been able to take more than general note of either the Kennedy Round or the major decisions concerning common prices which came into force on 1st July, 1967.

The chapter devoted to the U.K. is obviously written for the continental readership and is largely concerned with pointing out the differences between the agricultural economies of the U.K. and the Common Market. The author would have provided a better picture had he read the British White Paper *The C.A.P. of the E.E.C.*

The chief criticism of the book, which admittedly has to be selective, is that it does not devote enough attention to describing the methods by which the managed marketing is achieved for each of the major agricultural commodities.

Looking to the likely position in 1970, estimates are given to suggest there will be heavy surpluses of wheat (although the Community will remain a net importer of cereals), sugar beet, and milk products. The Community will need to continue to import beef and/or cattle—some 431,000 metric tons are likely to be imported in 1970.

G.W.F.

Planned Beef Production. STEPHEN WILLIAMS and C. DAVID EDGAR. Crosby Lockwood and Son, 1966. 35*s*.

This book should have a wide appeal to commercial beef producers and to students of beef production who wish to delve into certain untrodden areas. The severely practical approach is interesting for the authors are technically qualified in agricultural science and economics. Yet there are remarkably few figures, graphs and tables which one normally expects in a volume of this sort. It should, therefore, not be regarded as a reference book in the conventional way.

After reading the sections which stress the importance of good stockmanship and psychological responses of cattle to different forms of management, one begins to feel a little uneasy about the results of conventional animal experiments. How far they are influenced by the character of the man in charge of the animals and how the results might well be different with another stockman are matters of primary importance. The authors, therefore, do well to draw attention to animal behaviour, stress factors, bunt order and so on. This is still a cloudy field of work in animal research as well as in commercial management.

Mr. Stephen Williams' views on multiple suckling, conservation of hay, the type of live hedges and wire fences appropriate to beef cattle and the value of old-fashioned foods like roots and boiled barley have been well publicized in recent years. These are now brought together in this book.

It is impossible, of course, to deal in depth with all aspects of production and marketing within the confines of 180 pages. Yet it is a pity that more attention was not given to marketing for this is probably the weakest side of commercial production. Fattening of cattle is still a sideline with most producers but, nevertheless, a much more professional approach is required in this day and age. Different parts of the country need different types of fat cattle. Prices, too, are influenced by seasonal factors such as school holidays, temporary closing of industrial canteens, export demands and the like. The professionals recognize these factors but the rank and file do not. Profit margins in beef are notoriously fickle yet they are there for the observant.

This is an unorthodox book based on the lifetime's experience of a man who has had a foot in both the technical and commercial fields of beef production. There are not many of them about.

H.E.

The Mineral Nutrition of Livestock. E. J. UNDERWOOD. Commonwealth Agricultural Bureaux, 1966. 40*s*.

The importance of minerals in the nutrition of farm livestock has long been recognized, and the output of research papers on the numerous facets of the subject shows no signs of diminishing. Nevertheless, our knowledge of mineral nutrition is still very fluid and in many respects sadly fragmentary. Indeed, it is a marked characteristic that every review of the subject reveals such large gaps in our knowledge and indicates where opinions are so contradictory and divided.

In this admirably written book, Dr. Underwood has attempted, with considerable success, to present an objective view of the whole subject of mineral nutrition of farm livestock. He has been

very selective in his direct citations of literature, so that although each chapter is provided with a limited list of references it is possible for the reader to see the wood for the trees. All this makes for a most readable presentation, and he has managed to steer between the rocks of dogmatic assertions and the nebulous coastline of conflicting evidence. After introductory chapters setting out the needs for and discussing the principal sources of minerals he proceeds conventionally to deal with, first, the major, and then, the minor mineral elements, with a strong bias towards the type of practical problems in mineral nutrition as they crop up under farm conditions. The concluding chapter is particularly valuable, elaborating the general principles involved in detection and correction of mineral deficiencies and excesses in farm livestock. The practical investigator is given most excellent advice, not only on methods of approach but also on their limitations in application. This chapter should be thoroughly read and digested by every agricutural student, veterinary surgeon, adviser and food compounder. Application of the principles so outlined would do much to obviate the dogmatic conclusions so often reached after limited analysis of soil or pasture, or feedingstuffs, or biological fluids and tissues.

One minor criticism of the book is the omission of an index, and if at the next revision (a work of this calibre merits periodic reissue) this could be remedied, the publication should serve as an authoritative reference work on the subject for many years to come.

A.E.

That We May Live. JAMIE L. WHITTEN. D. Van Nostrand, 1966. 56*s*.

Mr. Whitten is a lawyer and a politician, a Congressman and the Chairman of the House Appropriations Sub-Committee on Agriculture, and his book is intended to be an answer to those who believe that the use of pesticides threatens the present and future health of the peoples of the U.S.A. It should be said at once that this book bears all the signs of being written by a lawyer-politician with a cause to plead. Yet there is much in it worthy of consideration.

The preface tells us that the book owes its conception to the scares aroused in the U.S.A. by the residues of aminotriazol in cranberries which cost 10 million dollars in compensation to growers, by Miss Rachel Carson's book *Silent Spring* and by the 8 million dollars paid to dairymen because of the detection of pesticide residues in milk by improved methods of analysis. Both the compensation issues arose from the application of the Food and Drug Authority's concept of zero tolerance which is now being abandoned. Rachel Carson's book was a highly emotional but well-written attack on the allegedly indiscriminate use of highly toxic and frequently persistent chemicals in pest control. Its publication had remarkable consequences in the United States including an inquiry on pesticides by the Surveys and Investigation Staff of the House of Representatives' Committee on Appropriations, the findings of which are reported briefly in this publication.

The edition covers, in a straightforward manner, from an entirely American standpoint, the productivity of the land, the essential need of chemical methods of maintaining and increasing this productivity, and emphasizes that dangers from the use of pesticides are controllable. It tries to refute allegations that wild-life is in danger of reduction or extinction and that human health is threatened. There is a chapter devoted to the present inadequacy of biological and mechanical methods for controlling plant and animal pests except in combination with chemicals.

This book is easy to read and I would have liked to have been able to say that such a book was badly needed, but for British readers anyway this is not it. Overemphasis weakens the case against those opposed to the use of chemicals in any shape or form in food production, and it is preoccupied with American problems of occasional over-usage of pesticides and the early adoption of a rigid control, particularly of residues.

The ex-attorney has presented his case. It will not, I fear, impress the scientific or other serious student of the subject, which is a pity.

H.R.B.

Seaweeds and Other Algae. C. L. DUDDINGTON. Faber and Faber, 1966. 36*s*.

The author of *Seaweeds and Other Algae* gives the impression that he is not fully aware of the vastness of the subject. Volumes could be written on seaweeds alone, and many botanists have spent a life-time working out problems posed by a few of the 'other algae' so that unless one is dealing with some particular aspect of the group, the undertaking would appear to be doomed to failure. However, Dr. Duddington is experienced in presenting this kind of digest, and he has succeeded in producing a readable book containing a fair amount

of basic instruction on the various types of algae, together with a sprinkling of more eye-catching information.

The systematic account ranges over the whole algal field from unicellular organisms to those with a relatively advanced kind of vegetative body such as is found amongst the 'wracks and kelps'. With a few exceptions, the descriptive matter is fairly accurate, but there is an apparent lack of balance, for while examples are given of all the major groups in the Chlorophyta and Rhodophyta, in the section on the Phaeophyta, important groups such as the Dictyosiphonales, are passed over without mention.

In a chapter entitled 'Algae at Home,' some interesting information is to be found on the subject of 'water-bloom', on algae as a nuisance in supplies of drinking water, and on their use in the treatment of sewage. The short chapter 'A Digression on the Nucleus' will leave most of us little the wiser.

One of the flaws in a book of this kind is that too many misleading generalizations are likely to be made; for instance, in describing the cells of a filamentous alga, the author speaks of 'each containing a single large chloroplast which in *Ulothrix* is a circular band round the cell'. While this may be true for *Ulothrix zonata*, many species have chloroplasts in the form of an incomplete band, which has a characteristic appearance under the microscope and with which many students will be more familiar.

If the writer is unfamiliar with the names of his plants or with some of the technical terms, he is almost bound to make mistakes, and, unfortunately, too many make their appearance in this text; for example: *esculentia* (*esculenta*), *Usnia* (*Usnea*), *leucostica* (*leucosticta*) *encrustans* (*incrustans*), polysiphoneous (polysiphonous), *Underia* (*Undaria*).

Dr. Duddington concludes chapter five with the sweeping statement: 'When we look at the Chlorophyta, however, we are looking at the ancestors of our garden plants of today'. Few modern biologists would dare to express themselves with such confidence.

The illustrations in this book are, generally speaking, perhaps adequate but certainly uninspired.

C.I.D.

Books Received

Survey of Potato Production in County Durham, 1965. Report 167G. W. T. Davison. Department of Agricultural Economics, University of Newcastle, 1967. 5*s*.

Documentation in Agriculture and Food. No. 85. Recommendations on the international standardisation of packaging for fruit and vegetables. Organisation for Economic Co-operation and Development, 1967. 17*s*. 6*d*.

Documentation in Agriculture and Food. No. 88. OECD scheme for the varietal certification of cereal seed moving in international trade. Organisation for Economic Co-operation and Development, 1967. 6*s*.

Planning the Farm Business. H.M. Stationery Office (Edinburgh), 1967, 8*s*. 6*d*.

ACKNOWLEDGEMENT OF PHOTOGRAPHS

We gratefully acknowledge permission to use the following photographs:

Front cover *Farmers Weekly*. P. 507 W. G. R. Weeks. P. 510 A. J. Stevens. P. 523 Roadless Traction Ltd. Pp. 527 and 533 *Shropshire Journal*. P. 530 Agripress Publicity Ltd. Pp. 537 and 538 Shropshire Farm Institute. P. 540 H. G. Clarke.

AGRICULTURE

Price 1s. 3d. net monthly (by post 1s. 9d.).

Subscription Rates, Home and Overseas: £1 1s. 0d. per annum (including postage).

Subscriptions may start with any issue and should be sent to:

HER MAJESTY'S STATIONERY OFFICE

49 High Holborn, London W.C.1
13a Castle Street, Edinburgh 2
Brazennose Street, Manchester 2
258-259 Broad Street, Birmingham 1
423 Oxford Street, London W.1
109 St. Mary Street, Cardiff CF1 1JW
50 Fairfax Street. Bristol 1
7-11 Linenhall Street, Belfast BT2 8AY

Single copies can be purchased from any of the above-mentioned addresses or through a bookseller.

Printed in England for Her Majesty's Stationery Office
by Hull Printers Limited, Willerby, Hull, Yorks.

(K102) 72-1-67-11

CERTROL
CERTROL
CERTROL

For Mayweed and other resistant weeds

WEEDAZOL
WEEDAZOL
WEEDAZOL

For Couchgrass, stubble and perennials in orchards

PRODUCTS OF RESEARCH
FORMULATIONS

Marks

A. H. MARKS & CO. LTD., WYKE, BRADFORD, YORKS
Telephone: Bradford 676372
Telegrams: Colour, Bradford

TAS/MK84A

This little pig went to market

...but it could have gone 2 weeks earlier and saved over 50-lbs of meal!

This is the measure of the increased fattening rate which can sometimes be effected by the inclusion of up to 2-lbs Copper Sulphate per ton of meal in the diet of fattening pigs.

COPPER SULPHATE

the ally of Agriculture

For details of this and other uses of Copper Sulphate write to:

McKECHNIE CHEMICALS LIMITED, P.O. BOX 4, DITTON ROAD, WIDNES, LANCS.
TELEPHONE: WIDNES 2611 TELEX 62171

Just Published

The

Repair and Maintenance of Agricultural Property

by

J. W. HOULDSWORTH, F.L.A.S.

This book covers the repair and maintenance of "fixed equipment" of agricultural holdings, which, as defined in section 94(1) of the 1948 Act, includes, in addition to buildings affixed to the land, works such as: roads, embankments, waterworks, drainage, electrical supply, hedges, ditches, etc.

Chapters: (1) Materials, Fixtures, Fittings; (2) Hedges, Fencing, Roads; (3) Specifications; (4) Specimen Specification; (5) Land Drainage; (6) Drainage to Farmhouse, Cottages and Buildings; (7) Electricity and Water Supply; (8) The Estate Maintenance Department; (9) Estate Records; (10) Liability for Repair; (11) Unit Priced Items, Appendices, Index, Plans and Photographs.

35s. net

THE ESTATES GAZETTE, LTD.

151 Wardour Street, London, W.1

Tel. 01 437 0141

EVENSTORM IRRIGATION—

★ **Rotary sprinklers** ★ **Rain guns**
★ **Organic irrigation (effluent disposal)**
★ **Portable aluminium mains**
★ **Glasshouse and outdoor spray lines**

EVENTHERM SPACE HEATERS—

Portable, oil-fired, up to 200,000 B.T.Us. Thermostatically controllable for frost protection in potato stores, etc.

Details from EVENPRODUCTS LTD., Evesham, Worcs. Tel. Evesham 6633/4.

OFFICIAL APPOINTMENTS

General agriculturists and agricultural specialists of many kinds are frequently required in the effort to match the large demand from the developing countries. The vacancies advertised below are a selection from the many openings which exist now. While they are being filled, other vacancies are arising.

Salaries within the ranges quoted are assessed on qualifications and experience; and the terms of most appointments include free or subsidised accommodation, education grants, family passages, good leave on full pay, etc. A contributory pension scheme is available in certain circumstances.

Most appointments are limited to nationals of the United Kingdom or the Republic of Ireland who are normally resident in those countries.

BOLIVIA

(BRITISH TROPICAL AGRICULTURAL MISSION)

A PASTURE RESEARCH OFFICER and ANIMAL HUSBANDRY OFFICER

Pasture Research Officer

RC 213/22/03

Duties: To continue a programme of research on intensive grasses in crop rotations and to advise and work with Bolivian technicians on experiments, extension, seed multiplication, field surveys, etc., with natural and cultivated pastures.

Qualifications: An Honours Degree in Botany with postgraduate experience in range management in the tropics and of work on intensive grasses. A working knowledge of Spanish is desirable.

Animal Husbandry Officer

RC 213/22/05

Duties: To advise and work in collaboration with Bolivian technicians on all aspects of the improvement of ranch management.

Qualifications: A degree in agriculture preferably with a postgraduate qualification or specialisation in the animal husbandry field and 10 years' experience in cattle ranch management.

Terms: Salaries of these posts range from £2,500 to £3,100 a year, subject to British income tax. Variable Overseas Allowances are also paid at the current rates of from £405 to £965 a year according to marital status. Contracts for two tours of 18 months.

EAST AFRICAN COMMON SERVICES ORGANISATION

Cytogeneticist/Plant Breeder

RC 213/214/02

Duties: Required as a member of a five-man team working on sorghum and millet breeding and development at Serere, Uganda.

Qualifications and terms: An honours degree in Botany or Agricultural Botany and not less than two years postgraduate experience.

Basic salary scale £1,128 to £1,494 a year, subject to Uganda income tax. In addition, an allowance, normally tax free, ranging from £744 to £852 a year will be paid by the British Government, on behalf of the East African Common Services Organisation, to an officer's bank account outside East Africa. 25% terminal gratuity. Two-year contract with prospect of renewal for a similar period.

OFFICIAL APPOINTMENTS

ETHIOPIA

Lecturers

RC 213

Lecturers in either Agricultural Science, Agricultural Mechanics, Animal husbandry, Agronomy or Farm Management are required to teach at the Jimma and Ambo Agricultural Schools.

Candidates must have an appropriate university degree with practical and teaching experience in their subjects.

Salaries £1,760 to £2,700 a year, subject to British income tax, plus variable non-taxable overseas allowances of either £625 single, £1,020 married unaccompanied, or £1,275 married accompanied, a year. Three years' contract.

FIJI

Soil Scientist

RC 213/62/09

Duties: To carry out soil surveys on a detailed regional basis to follow on the reconnaissance survey already completed and to be responsible for field soil survey work on proposed development areas.

Qualifications and terms: An Honours Degree in Geology or Geography and postgraduate experience in soil surveys in tropical areas.

Salary: £1,208—£2,414 a year plus 25% gratuity contract 30 to 36 months.

GAMBIA

Agronomist

RC 213/68/02

Duties: To design, carry out, supervise and analyse all agronomic experimentation on various crops; to make recommendations for the extension service and to investigate suitable crop rotations.

Qualifications and terms: A degree in agriculture with postgraduate training or experience in field experimentation. At least five years' experience of tropical crops is essential.

Salary £1,980—£2,224 a year plus 25% gratuity. Contract two tours of 15–18 months.

NEPAL

Tea Expert

RC 213/117/02

Duties: To assist the Nepal Tea Development Corporation as Chief Executive Officer in the management and development of a recently established tea plantation in the Ilam district of East Nepal. Candidates should have fifteen years financial, technical and administrative experience of overall tea management on sound commercial lines preferably from the Darjeeling/Assam area. Knowledge of Nepali essential.

Terms: Salary £3,500 to £4,000 a year subject to British Income Tax, plus a variable tax free overseas allowance currently ranging from £420 to £1,040 a year depending on Marital Status. Two-year contract.

If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:

Appointments Officer
MINISTRY OF OVERSEAS DEVELOPMENT
Room 324a, Eland House, Stag Place,
London, S.W.1.

MINISTRY OF OVERSEAS DEVELOPMENT

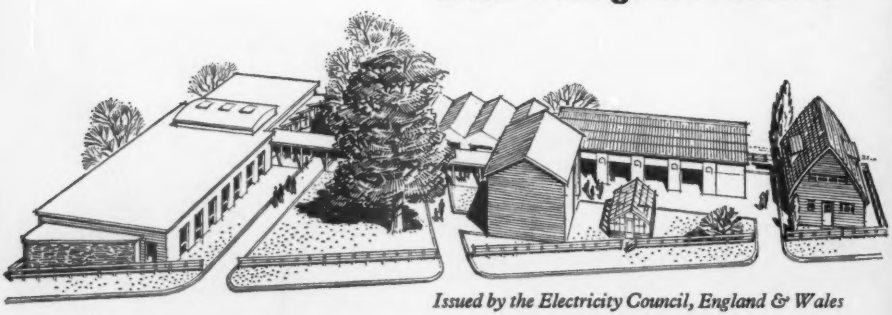
The New Electro-Agricultural Centre at Stoneleigh

A permanent, modern Electro-Agricultural Centre was opened at the National Agricultural Centre, Stoneleigh, on the occasion of the Royal Show. This Centre provides extensive conference and training facilities, a well stocked reference library and ample provision for the demonstration of new equipment. By means of this new Centre, the Electricity Council is helping farmers to keep up to date with the latest electrical developments in agriculture. The Centre operates in conjunction with the demonstration areas of the N.A.C. and farmers can see electrical methods demonstrated as part of the many new farming techniques.

Advice and information about electric farming methods is freely available and full-time specialist staff are in attendance. Intensive training courses and conference facilities are also available for use by recognised agricultural organisations. The new Centre is designed to meet the needs of all sections of the agricultural industry and to assist farmers in their efforts to increase productivity and cut costs.

For further information regarding the facilities offered by The Electro-Agricultural Centre contact your local Electricity Board; The Electricity Council, EDA Division, Trafalgar Buildings, 1 Charing Cross, London SW1; or the Deputy Secretary (N.A.C.), Royal Agricultural Society of England, National Agricultural Centre, Kenilworth, Warwickshire.

Better things are electric



Issued by the Electricity Council, England & Wales